THE MEDICAL JOURNAL OF AUSTRALIA

VOL. II.—15TH YEAR. SYDNEY, SATURDAY, OCTOBER 6, 1928. No. 14.

Authors of articles submitted for publication are requested to read the following instructions and to comply with them.

All articles must be typed with double or treble spacing. Carbon copies should not be sent. Abbreviations should be avoided, especially those of a technical character at times employed in ward notes. Words and sentences should not be underlined or typed in capitals. The selection of the correct type is undertaken by the Editors. When illustrations are required, good photographic prints on glossy gaslight papers should be submitted. Each print should be enclosed in a sheet of paper. On this sheet of paper the number of the figure and the legend to appear below the print should be typed or legibly written. On no account should any mark be made on the back of the photographic print. If no good print is available, negatives may be submitted. Line drawings, graphs, charts and the like should be drawn on thick, white paper in India ink by a person accustomed to draw for reproduction. The drawings should be large and boldly executed and all figures, lettering and symbols should be of sufficient strength and size to remain clear after reduction. Skiagrams can be reproduced satisfactorily only if good prints or negatives are available. The reproduction of all illustrations but especially of skiagrams entails the sacrifice of time and energy and is expensive. Authors are expected to take a corresponding amount of trouble on the preparation of their illustrations, whether skiagrams, photographs, wash drawings or line drawings. The references to articles and books quoted must be accurate and should be compiled according to the following scheme. The order should correspond to the order of appearance in the article. The initials and surnames of the authors, the full title of the article or book, the full (unabbreviated) title of the journal in which the article appears, the date of the issue (day, month and year) and the number of the first page should be given in this sequence.

Table of Contents

The Joseph Bancroft Memorial Lecture.

FUNCTIONAL ANATOMY AND MEDICAL PRACTICE.[1]

By William Colin MacKenzie, M.D. (Melbourne),
Professor of Comparative Anatomy and Director, Australian Institute of Anatomy.

Introduction.

The history of this oration and the works of the distinguished scientist whose name it bears, are familiar to you all. There is no more fitting way of honouring the memory of one who has advanced medical science as Joseph Bancroft has done, than by the delivery of an annual lecture; but on the person who has been entrusted with the delivery, not only has a very great honour been conferred, but also a great responsibility. My contribution tonight to the memory of Joseph Bancroft deals with the anatomy of function, a subject of vital importance to the specialist, be he surgeon or physician, as well as to the general practitioner. Today all is not well with the study of human anatomy. There is a depreciation of its value which is reacting unfavourably on medical and surgical thought and practice. Although regarded as the basic of all the medical sciences, anatomy is too often considered merely from the examination standpoint—a subject in the medical curriculum to be soon forgotten and not a necessity throughout the whole course of medical practice. How many medical graduates since the time of their senior examination in anatomy have dissected a human brain? Yet there was a time when they could recite the description and relationships of the parts word for word with the text book. Why has interest in the central nervous system, for example, not been maintained? It can scarcely be said that there is a difficulty in obtaining material.

In his Thomas Vicary Lecture,[2] Professor Elliot Smith stated that:

> At the present time it is not only the physiologists and clinicians who fail to realize the importance of morphology, but also some anatomists, and even more biologists. In some famous medical schools it is considered almost an offence on the part of an anatomist to work at real anatomy; at the present time in many schools medicine and surgery are suffering from the neglect of adequate anatomical inquiry into the reasons for diagnostic and therapeutic failures.

This attitude on the part of the teacher reacts unfavourably on the mind of the medical student who is led to discount the high value of an anatomical training for his or her subsequent medical career. To what is this apathy in anatomy due? Undoubtedly, to the fact that within the last half century too much attention in the course of zoology as well as anatomy has been paid to structure and too little to function on which structure depends and which it should serve to interpret. Sir Berkeley Moynihan in a recent address at King's College Hospital Medical School has directed the attention of surgeons to the divorce of functional from structural anatomy and asks:

> Why are so many anatomists content to teach only on the dead body and physiologists to expound truths on animals, when a visit to the wards would enable the teacher to impress indelibly on the minds of his pupils those same truths demonstrated upon the human body?

Moynihan compares the teaching of structural anatomy to that of the plan of a city in which the names of houses and streets are emphasized, but not the people who live in them nor their industries nor mode of life. Properly directed, the medical student can learn more in an hour about the action of muscles from a patient with infantile paralysis in a hospital ward, than in weeks spent on the cadaver only or from anatomy books. Structural anatomy, that is anatomy without reference to ancestral history and function, is a boredom and is quickly forgotten.

But if we compare the human body with that of the lower forms of life, that is with animals in which the complex entities of the human body are revealed in their simplier forms, we have a means of tracing origins and the factors in their production. Sir Charles Bell in his introduction to "Bell's Anatomy," in the opinion of many the greatest anatomical text book ever written, stated that:

> Human anatomy cannot be highly cultivated without the assistance of comparative anatomy; it cannot be considered a liberal study nor properly preserved in relation to general science without a continual reference to natural history and the chain of animal existence.

In the course of zoology for medical students stress should be laid on a comparison of vertebrates with the human subject.

How little attention is paid by teachers and medical practitioners in Australia to our unique and fast disappearing fauna which enables us to study human embryology from the functional standpoint.

Operations for uterine support are numerous, yet how little investigation has been carried out concerning the mechanism of uterine support from the functional and developmental side. Do we ever associate the atrophied round ligament, met with in the human inguinal canal, with the highly developed muscle band passing from the canal to the back of the pouch in the Australian marsupial? How can midwifery be raised from an art to a science, unless we know the impetus in response to which the lowest mammal, the platypus, lays an egg into a coarse nest; the marsupial gives birth to a 2·5 centimetre (one inch) embryo at about the thirtieth day which in the case of the kangaroo may reach the great height of 230 centimetres (eight feet); and the human fœtus is extruded normally at the ninth month. The great problem of unification of the Müllerian ducts which is associated with migration of the kidney and the transposition of entrance of the ureter and genital ducts—in the platypus, the ureter is the more distal to the duct and in the marsupial the more proximal—are best studied in our fauna. Tonight, I wish to deal with some everyday anatomical problems, not from the point of view of an examination in structure, but

[1] Delivered at Brisbane on August 3, 1928.
[2] *The British Medical Journal*, November 6, 1926.

from the functional and comparative standpoint and will use wherever possible as illustrations members of our native fauna found in the State of Queensland.

The Human Mandible or Lower Jaw.

During the last two decades no structure in the human body has received more attention from medical practitioners than the lower jaw—the gateway through which food enters the body—and no structure has been more blamed for causing disease in other parts, from backache to cancer. Considered from the point of view of functional development, the mandible represents an historic document showing evidence of its history traceable back to the lowest mammals. The great developmental changes have occurred particularly about the basal portion between the two angles.

If we examine an ordinary adult European mandible, we find that few teeth have remained, the incisor teeth are inclined backwards, the inner surface about the middle part or symphysis is smooth and slopes not downwards and backwards so as to encroach on the floor of the mouth, but rather downwards and forwards and a chin is formed. But all human mandibles are not like that. In the Australian aboriginal, for example, the incisor teeth incline rather forwards, a projecting chin is not so well developed as in moderns and there is a complete arcade of teeth including the three molars and sometimes the fourth. In the anthropoid no chin is developed, the incisor teeth project markedly forwards and the inner surface slopes downwards and backwards encroaching on the floor of the mouth. This surface presents a well marked bony plate or prominence with a depression or pit below. Between the anthropoid type and the Australian aboriginal, human jaws have been found—notably the Heidelberg, the largest known mandible and the Piltdown—in which the chins were absent, and the bony plate and pit on the inner surface present as in the anthropoids, though not so prominently. To understand the significance of these changes in the mandibles of the anthropoid, primitive man, Australian aboriginal and modern European, we must go back to the marsupial and in the kangaroo we find a pincer formation of snout, the incisor teeth being supported on two long columns or buttresses of bone. In the case of one of the highest catarrhine monkeys—the baboon—we find a retention of the pincer-like snout and on the inner surface a thick supporting wall of bone narrowing the front of the mouth area. With the diminution of the use of the mandible for tearing, biting and nipping and the increasing functions of mastication and grinding the front teeth atrophy, becoming less horizontal and more vertical and instead of sloping forward tend rather to incline back into the mouth. The result of this alteration of function is that the bony buttress necessary for the support of the snout also shrinks and we meet in the anthropoid that stage of atrophy represented by the bony ridge and pit (see Figure I). If this were not retained, the mandible of the anthropoid, having no chin development, as in the modern European, would be acting at a mechanical disadvantage. As the human ancestral type became more erect, speech made its appearance necessitating a broadening of the tongue with increasing function of tongue muscles. As a result of this we find enlargement of the width below and atrophy of the Simian ridge of bone and disappearance of the pit. Furthermore, with the increase of muscle function associated with the erect posture, the lower margin becomes thickened and in Australian and modern jaws we see a banking up of bone on the anterior face accentuating the chin. The two factors operating on the human mandible, apart from the acquisition of the erect posture, are articulate speech and mastication. The Cohuna and Barham men who lived on the banks of our own River Murray and whose teeth as evidenced by the skulls in the possession of the Australian Institute of Anatomy show an enamelled surface without trace of decay, were unacquainted with hash and tinned stuff and used no medicated pastes or brushes.

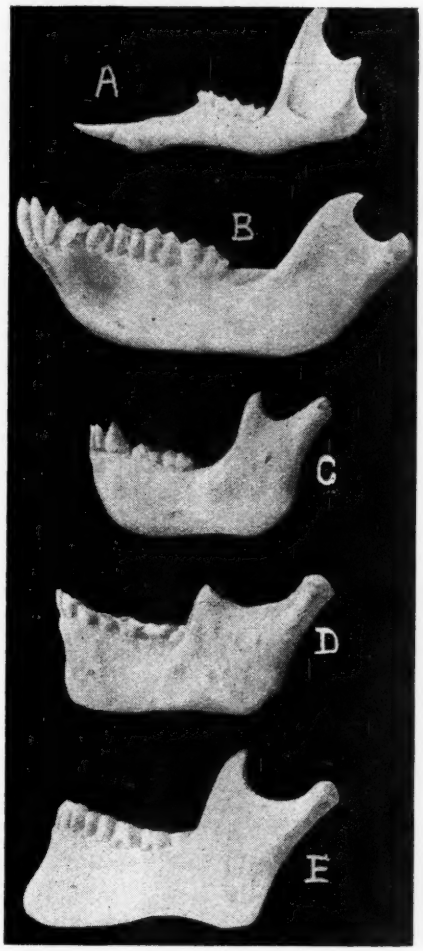


FIGURE I.
Showing Development of Mandible. A = Kangaroo, B = Baboon, C = Orang, D = Australian Aboriginal, E = Modern European.

In my opinion the upper and lower arcades of teeth in the Barham skull which are exhibited here this evening, could be regarded as the ideal. Today it is almost impossible to obtain a modern European

or modern Australian skull showing the dentition complete. Atrophy is the price of disuse.

Old and New Brain.

When we examine the inner or mesial surface of the human brain in the manner usually carried out at *post mortem* examinations, namely, by slicing vertically between the hemispheres, we visualize a series of structures that can tell us much about human development. The whole picture might almost be compared to a battlefield with this difference that the conflict here has waged for many ages past, it is still being carried on and it will continue into the future. We see the great coordinating band, the *corpus callosum*, passing from one hemisphere to the other. Then there is the peculiar structure, the *septum lucidum*, fleshy and relatively large in some, fibrous and almost disappeared in others. Below the *septum lucidum* is that structure whose name we juggled with in our student days, the *fornix*, and if we trace the *fornix* into the interior of the brain we find it is continuous with a structure presenting a free edge — the *fimbriatum* (*hippocampus*). A little lower down we see a small connecting commissure, the anterior or ventral commissure, and more posteriorally we see the great sensory station, the *thalamus*. In higher mammals, such as the orang, our dividing knife will have passed through thalamic tissue; in the human it may have passed actually between a right and left *thalamus* or through a connecting band almost insignificant in some, but much larger in others—the so-called middle commissure. Let us take these structures as representative of the complex cerebral machine and see what clues comparative and functional anatomy can afford us concerning them. How interesting if we could demonstrate mammalian brains without a *corpus callosum* or without a *fornix;* with a *thalamus* showing no attempt at division, no *septum lucidum* and a large ventral or anterior commissure. Imagine having in Australia at one end of the series mammals without a *corpus callosum* and at the other a mammal in which it has reached its greatest development. I would now ask you to accompany me into the Queensland bush and see what it has to offer us anatomically. We have not proceeded far before we meet two beautiful varieties of reptiles, the blue-tongued lizard or skink (*Tiliqua scincoides*) and the frilled lizard (*Chlamydosaurus kingii*), the former crawling on its abdominal wall, using its limbs for propulsion and not for support and the latter moving by means of its hind limbs and tail upwards towards the erect posture. The blue-tongued lizard moves in a limited horizon and has a large dependence on the sense of smell.

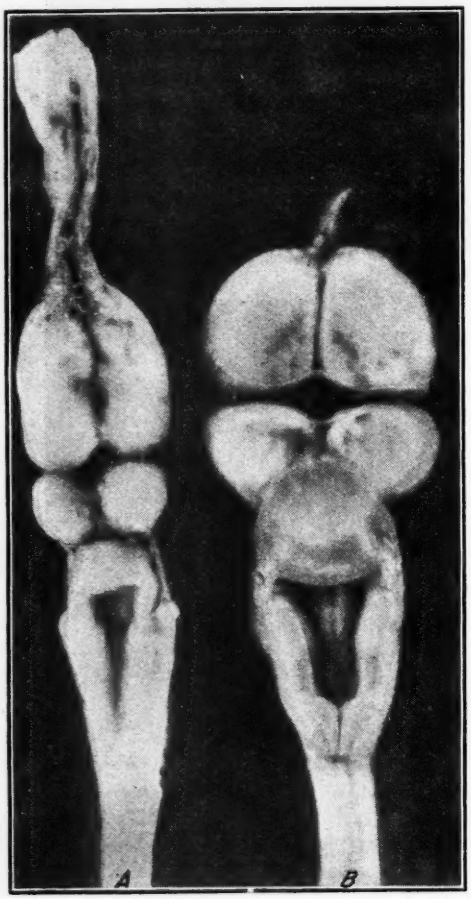


Figure II.
Showing Brains of Australian Lizards. A = Blue-tongued, B = Frilled.

The frilled lizard has increased its horizon since it is able to elevate its body and look around. In the crawling lizard smell is an important sense; but in the frilled lizard Nature has shown us that with the erect posture vision takes precedence over smell; and this is borne out by an examination of the brain of these lizards (see Figure II). Each has an afferent thalamo-cortical system and an efferent cortico-striate-pyramidal system as in the human brain. If we examine the inner surface as we did with the human brain, we find that the wall of one side is connected in front with that of the other by the dorsal or hippocampal commissure—represented by the disappearing *fornix* in us—and below connecting the two striate bodies is the ventral commissure — the disappearing anterior commissure in us. There is no free edge or *fimbriatum* in the interior of the brain of the reptile, thus distinguishing it from the mammalian brain, and there is no evidence of a *corpus callosum* (see Figure III). In the case of the blue-tongued lizard there is a well defined olfactory system, but in the frilled lizard the olfactory nerves have dwindled to the size of two cotton threads and the optic lobes are well defined. The white matter in the reptilian brain, unlike that of the mammalian brain, is external to the grey. As we continue our travels in the bush, we are certain to meet with the kangaroo, the native bear or koala and echidna in the day time and the common phalanger or opossum (*Trichosurus*) and possibly the platypus in the evening, and they will tell us a great deal more about the interpretation of the mesial surface of the human brain. We leave the reptile behind and now advance towards the human pattern. Suppose we examine the mesial surface of

the brain of one of these marsupials, we find that whilst in the frilled lizard there is the genesis of the *thalamus*, here it is well developed and our section goes through thalamic tissue (see Figure IV). It is not until we reach the erect posture, that a double *thalamus* can be defined. No *corpus callosum* is seen as in higher mammals. We have, as in the reptile, the dorsal or hippocampal commissure (*fornix* in us) connecting one cortex with the other, and a ventral commissure (anterior in us) between the striate or motor bodies. The olfactory nerve does not come off the front of the brain, but it is traced to a small olfactory area in front of the commissures and if we opened the cerebrum, we would find that this area and the dorsal commissure were continuous with a free edge in the interior, the *fimbriatum* (*hippocampus*). That free edge really represents the front of the reptilian brain and, like it, is the portion of the human brain with white matter externally. But in our marsupial brain above the olfactory area and the olfactory nerve a new portion of brain has arisen which is gradually turning in and encroaching on the olfactory area which will be converted in the higher mammals into fibrous tissue, the *septum lucidum*, and will finally disappear, limiting the olfactory area to the under surface as is seen in us. The brain has not grown by a pushing forward from the front of the reptilian brain, because vision is the important sense and not smell which even in the lowly frilled lizard was of secondary importance. It is inconceivable that a lessening special sense like smell should be the exciting stimulant for brain growth in higher mammals. Too much has been written about the importance of smell in brain development. One sense does not originate structure dealing with some other separate sense or function. Separate structures are the results of separate functional needs. The growth is from behind where we have the big impulses coming up to the developing *thalamus*, associated especially with the effort towards the erect posture. The grey matter overflows through the white and extension is forward over the reptilian brain. I know of no better illustration of this than a vertical section through one half of the dog's brain showing the continuity of the grey and white matter of the cerebrum with the fimbriatum (see Figure V). With this increasing forward development of brain the dorsal or hippocampal commissure whose main function was to coordinate the smell portions of the brain in the reptile, becomes unequal to the strain and the necessity for a few more extensive commissures—the *corpus callosum*—has arisen, the genesis of which we can study in the kangaroo. It is not a leap, as Huxley once stated, but a correlated necessity, the result of frontal brain development and olfactory atrophy. The starting point of this is at the dorsal commissure, the old path on which the new path is raised at a higher level. If we examine the mesial aspect of the brain in higher mammals such as dog, monkey and man, we find that the *fornix* is really our old atrophied dorsal or hippocampal commissure and the *septum lucidum* the fibrous remains of the old olfactory area (reptilian) on the mesial aspect and in succession we see that these animals illustrate how the frontal lobe, developing and curving round, gradually invades and will obliterate the functionally inactive *septum lucidum*. With the appearance of the *callosum* we see a diminution in size of the ventral or striate commissure. The *corpus callosum* is completely dominating coordination. Thus we see that the front of the brain is not as many suppose, the prefrontal portion; but the free fimbriated or hippocampal edge in the interior—the part of the human brain still retaining, as in the lizard, white matter externally. The prefrontal portion is a recently developed one and is associated with the characteristic human forehead. In the prehistoric

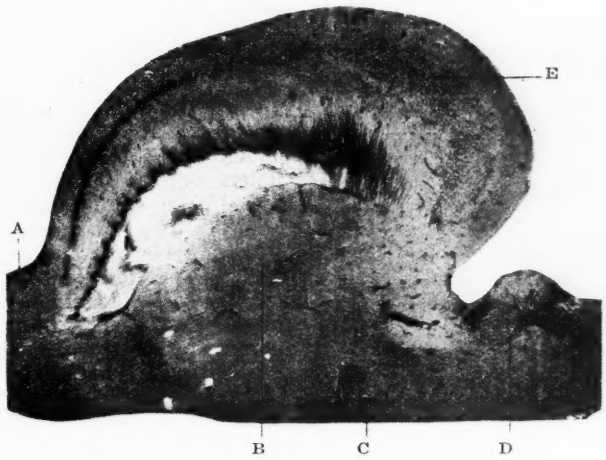


FIGURE III.

Showing Brain of Australian Lizard. Low power Microphotograph. A = Olfactory, B = *Striatum*, C = Ventral Commissure, D = *Thalamus*, E = Cortical Cells.

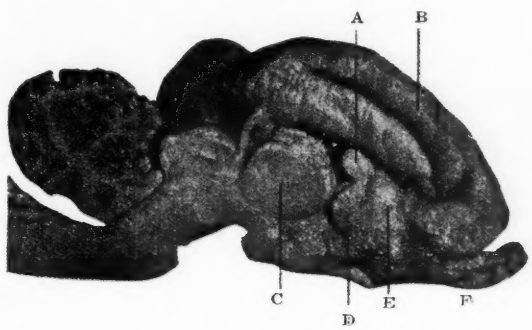


FIGURE IV.

Showing Mesial Surface of Marsupial Brain. A = Dorsal Commissure, B = Cerebrum, C = *Thalamus*, D = Ventral Commissure, E = Olfactory Area, F = Olfactory Nerve.

completely fossilized Cohuna skull there is no forehead. The Cohuna man could not have worn a modern hat or cap.

The Colon, Great Omentum and Lesser Sac.

Probably the most difficult of all portions of the human body for medical students to understand is the region of the lesser sac. They are taught to

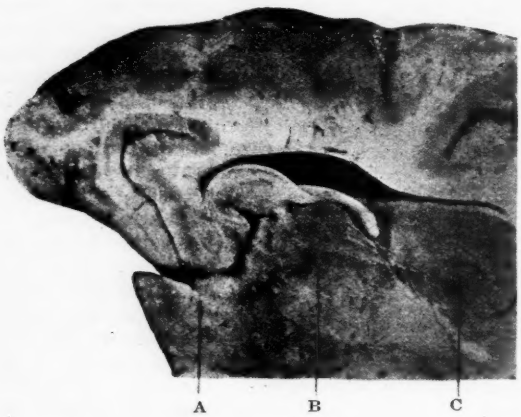


FIGURE V.
Dissection of Brain of Dog to Show Continuity of Grey and White Matter of Cerebrum and *Fimbriatum*. A = Quadrigeminal Body, B = *Thalamus*, C = *Striatum*.

regard it structurally, not developmentally and, to increase their troubles, the colon which actually consists of but two portions—a right or mesenteric and a left or mesocolic—is divided into no less than eight parts, namely, caecum, ascending colon, hepatic flexure, transverse colon, splenic flexure, descending colon, iliac colon and pelvic colon.

How does the human colon come into relationship with the so-called lesser sac? What is the necessity for origin of the great omentum? How can lax and dropping colons be anatomically explained?

Let us pay a visit once more to our friends in the Queensland bush and they will explain to us in a simple way the complex human condition, because in our travels we are going to meet animals without a great omentum, animals in which it is first recognized and animals in which it is fully developed. We must remember that the intestines, like the kidneys, are retroperitoneal. In front of them is a closed bag—the peritoneal sac—one wall of which we open when we incise the anterior abdominal wall and the other when we have defined the viscus. The laxity of an organ depends on the amount of the posterior sac wall, that is posterior peritoneum, it is invested with. Suppose we begin our investigations by examining two lizards whose acquaintance we have already made, namely, the blue-tongued lizard crawling on its abdominal wall and the frilled lizard trending upwards towards the erect posture. Although in neither is a great omentum present, yet striking differences are met with in their intestinal pattern. In the blue-tongued variety we have a simple gastro-intestinal canal composed of stomach, small intestine and colon, swung on a dorsal mesentery differentiated into mesogaster opposite the stomach, mesentery for the small intestine and mesocolon for the colon. The spleen is miniature and a strand of pancreatic tissue is recognized (see Figure VI).

In the frilled lizard we note that here also the three parts of the gastro-intestine can be differentiated, swung on the dorsal mesentery; but in response to the muscular effort made towards the erect posture a peritoneal band is described, drawing the commencement of the colon into relationship with the pyloric region—the first indication of dorsal fixation of the intestinal tract. At the junction of the small intestine and colon we notice a well defined blind gut—the genesis of the caecum or appendix—and in the colon itself a constriction which corresponds to a control station at the junction of the right and left colons of higher mammals—the hepatic lock. Thus this reptile gives us our first clue to the significance of the human pattern. In it we see the genesis of dorsal fixation, of the caecum and appendix, and the division of the colon into right and left sides, that is, into a mesenteric colon swung with the small intestine on mesentery and a left or mesocolic swung on the mesocolon (see Figure VII). In spite of this no appreciable change in development is noted in connexion with the spleen and pancreas and no great omentum is present. Though there is a highly developed liver with gall bladder and ducts,

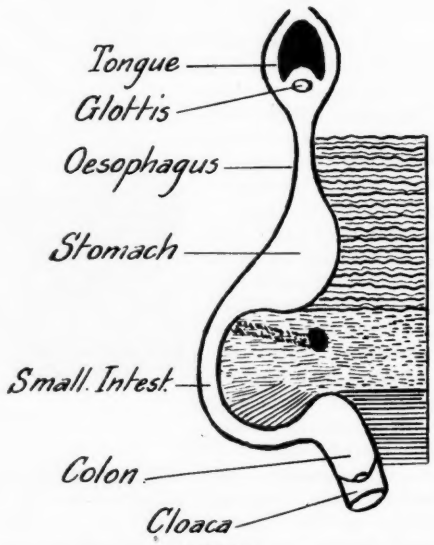


FIGURE VI.
Showing Gastro-Intestine of Blue Tongued Lizard.

no "foramen of Winslow" can be defined. If we now pass to the lowest mammal, the platypus, we find that, concomitant with the development of a four-chambered heart and diaphragm, the spleen, swung on its own mesentery—the great or splenic

omentum which is simply a fold from the dorsal peritoneum—has greatly enlarged, spreading across the abdominal cavity and may reach eighteen centimetres in length. The primary development of the great omentum was for splenic development. In the platypus whose movement is somewhat reptilian, there is mobility of the enlarged spleen.

With the development of the erect posture and risk of torsion fixation in the left hypochondriac

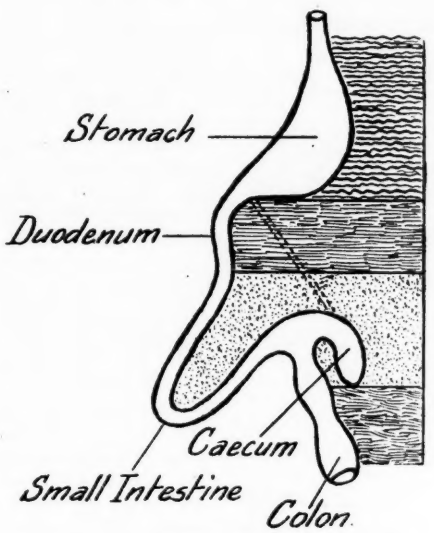


FIGURE VII.
Showing Gastro-Intestine of Frilled Lizard.

region both of spleen and colon became necessary and this can be best studied in what I regard as a key mammal—the common phalanger or opossum (*Trichosurus*). The frilled lizard and the platypus present us with an unsolved basic problem in blood development, namely, what is the impetus that has caused the miniature reptilian spleen to enlarge in the platypus to nearly twenty centimetres in length. The problem is the same in the highest mammal, the human, as in the lowest, the platypus.

I now wish to draw your attention to the gastro-intestine in a lowly marsupial the common phalanger or opossum—an animal which though vital for the correct understanding of human anatomy and physiology is destroyed to the extent of hundreds of thousands annually (see Figure VIII). Through it we can interpret the bearing of the gastro-intestine of the frilled lizard on the human pattern. We find on examination that the colon has assumed somewhat the human pattern and is attached dorsally at the pyloric region by a mesial or suspensory fold, best demonstrated in the koala or native bear. This fold, of vital importance in the consideration of visceroptosis, we saw in the frilled lizard, approximating the proximal part of the colon to the pylorus. Apart from this fixation the rest of the colon is mobile and can be freely raised from the dorsal wall. The part on the right has greatly developed and corresponds to the proximal part of the colon in the frilled lizard. It can be raised freely with the small intestine, as both are swung on the mesentery. The part on the left can be raised separately, being swung on its own peritoneal fold or mesocolon. This corresponds to the distal part of the colon in the frilled lizard. There is no attempt at dorsal fixation of either the right or left colon as in us. A well developed great or splenic omentum is present, but is nowhere in relation with the colon as it is in us. The spleen is approaching the left hypochondrium and is becoming fixed partly by the contraction of the cardiac part of the great omentum and partly by a fold—the lieno-renal peritoneal fold—anchoring it to the left kidney. In no animal can the lieno-renal ligament be so well demonstrated as in our common opossum. The great omentum, apart from the contracting cardiac portion, is seen to be well developed. Its primary function was in connexion with splenic development and mobility. Why can it still be demonstrated in the human with a spleen well fixed in the left hypochondrium? This is because a new secondary function, namely, hitching up of the colon between the pylorus and the spleen, has necessitated its temporary retention. In the opossum, as indeed in higher mammals, it looks as if the great omentum were a development from the great curvature of the stomach. This is not so. In our lizards we have what is practically a human development of liver and gall bladder, but no foramen of Winslow.

The liver was an old well-established organ in the primitive lizards. They have also a well-defined stomach, but no great omentum. In them is no so-called lesser sac opening into the general peri-

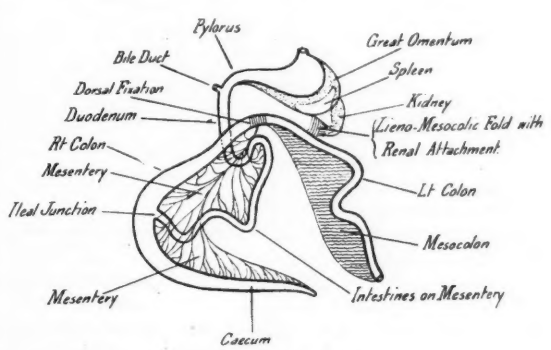


FIGURE VIII.
Showing Gastro-Intestinal Tract of Common Phalanger (Opossum).

toneal sac. The great omentum is not dependent on the stomach for its development, but on the spleen. There was originally an interval between the folds from the dorsal peritoneum embracing the spleen and those embracing the stomach, which has disappeared with stomach development and splenic fixation. The great omentum is continuous with the serous or peritoneal coat over the stomach. Both are derived from and continuous with the

peritoneum over the dorsal abdominal wall. To arrive at the human pattern of intestine from the opossum we have only to study the lemurs, platyrrhine and cattarrhine monkeys, anthropoids and man and in them a direct sequence can be demonstrated. The functional factors at work are diet and the erect posture. The caecum must shorten, giving rise to an appendix. The right and left colons become fixed dorsally. The fixation of the spleen in the left hypochondrium is the most important factor in the fixation of the left colon, for through the lieno-renal ligament not only is there an anchorage to the left kidney, but also a traction on the mesocolon or mesentery of the left colon. From this point fixation of the left colon and mesocolon by bands to the dorsal abdominal wall begins and that is why the sigmoid is the last part to be dorsally fixed (see Figure IX). In the case of the right colon fixation begins at the mesial fixation area opposite the pylorus and proceeds downwards, fixing the mesentery to the duodenum and the dorsal wall and that is why the distal part of the caecum is usually mobile. In the portion between the mesial attachment and the spleen fixation proceeds from the pylorus to the spleen and the chief factor in this is the great omentum which sends bands to the colon and its mesocolon. The genesis of this can be studied in the kangaroo with its attempt at the erect posture. Lax colons are due to failures of these processes. A strangulated omentum should be regarded from this viewpoint. The right colon is our caecum, ascending colon and hepatic flexure. This is the mesenteric or experimental colon. The left colon is our transverse colon, splenic flexure, descending colon, iliac colon and pelvic colon. Developmentally these are two distinct divisions of colon and as such it should be considered by the physician, the surgeon and the pathologist.

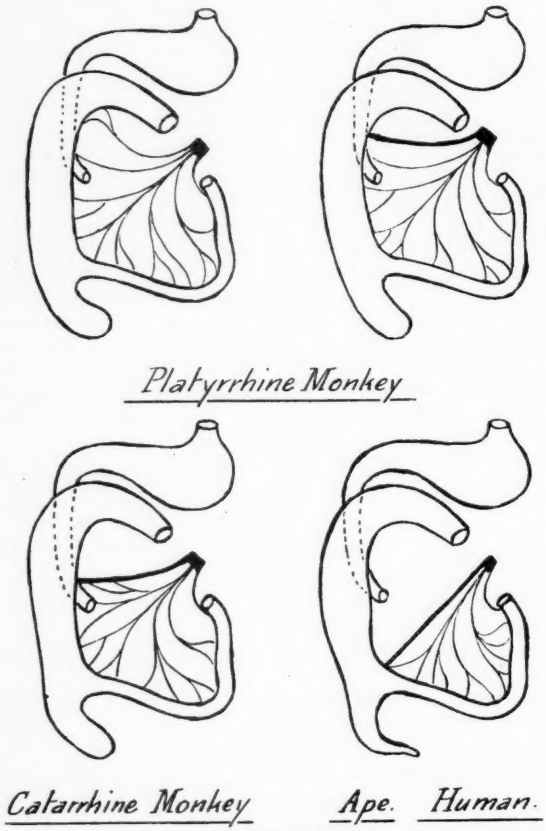


FIGURE IX.
Showing Development of Base of Mesentery.

The Erect Posture and Infantile Paralysis.

Human intelligence associated with which is the prefrontal brain and the typical human forehead is correlated in its development with the erect posture and the mechanism and functional history of this should be made a leading feature in all anatomical textbooks. Yet this is a subject to which but scanty reference is paid. My first serious attention to it was given in connexion with the treatment of infantile paralysis.

When we were students, the patella was of great concern from the point of view of the oral examination, as to which was right and left, the edges, the extremities and the surface elevations and depressions. What is more important, however, is to regard the patella as one of the most important agents in maintaining our erect posture. The great extensor muscle engines from the sides and front of the femur which extend the knee joint so essential in standing and walking, would have their effectiveness dissipated were it not that power is concentrated at the knee cap and so their leverage improved. In the Australian Institute of Anatomy you can study side by side the patellæ of the kangaroo, orang, chimpanzee, gorilla and the human. Of these the largest patella is found in the mammal most erect and with the most intelligence. The addition of new functions to the extensor muscle in response to the urge to become erect is correlated to an enlarged patella. This is a region of unrest.

Similarly another region of unrest is the gluteal region. The extending muscle of the hip, the great or *ectogluteus*, reaches its maximum development in the human subject and I show tonight a series of dissections from the Institute of Anatomy illustrating its development from the giant iguana of Australia up to man (see Figure X). The importance of the patellar region in keeping the body erect is shown in the treatment of, for example, a boy with a swinging limb owing to contracted knee following infantile paralysis. If we straighten the knee by continuous pressure and keep it extended by means of a board bandaged behind the knee, that is create an artificial *quadriceps*, the patient can stand. That was a big advance in the treatment of the paralytic. By means of muscle reeducation it was found that function could be restored in those old cases even to the extent of standing unsupported. A further principle in treatment was that bone was the slave

of muscle—movement occurred before bone was called into being—and that if a fractured bone had to be rested, was it not as imperative to rest a paralysed or fractured muscle. Thus instead of flogging the tired horse up the hill, by massage and electricity it was given a rest and asked to move on a level road. In this way was initiated the problem of muscle rest and reeducation which means that the muscle is placed in a position of anatomical rest (zero position) and only asked to perform the work it can actually do, that is it is not asked to do forty units of work before it can perform twenty units. This was regarded as revolutionary, since it was thought that with rest a paralysed muscle would wither. But such is not so and these principles have been followed throughout the world, not only in regard to infantile paralysis, but in the treatment of neuro-muscular disease in general. The principle of rest I enunciated in 1909 and as pointed out in *International Clinics*, Volume 1, 1912:

> Up to that time the usual treatment after subsidence of the acute stage had been to apply massage and electricity to the paralysed parts and eventually to place them in splints. While some patients have been benefited by this treatment the majority have been uninfluenced by it and have subsequently exhibited pitiful contractures.

The next problem was to determine whether the principle that a muscle should not be asked to attempt forty units before being perfect at thirty units had a developmental or, as I originally put it, a biological basis. This led to a very exhaustive study over many years on muscle action in the reptiles and mammals. At one end was the blue-tongued lizard using its limbs for bodily propulsion only and not for bodily support and at the other the human type not only able to progress on four limbs, but able to stand erect on two limbs and to elevate the hanging front limbs above the head. A progressive study between these two is really the history of the mechanism and functional development of the erect posture. The human erect posture is recently acquired, is unstable, in an experimental stage and easily attacked and we have to recognize that infantile paralysis, like many other neuro-muscular diseases, is really an attack on the erect posture mechanism (see Figure XI). That was the problem affecting 80% of wounded men in the Great War—to enable them to walk on two legs instead of crawling on four and to feed themselves when standing or sitting up in bed.

Remember that primitive man, with abducted lower limbs and sagging knees, had a fight to maintain the erect posture. The aboriginal with his thin legs and long arms is nearer to these people than we and his so-called laziness has a physiological basis. The aboriginal boy sitting at school on seats without backs, directs only part of his attention to lessons; the rest is devoted to keeping himself erect.

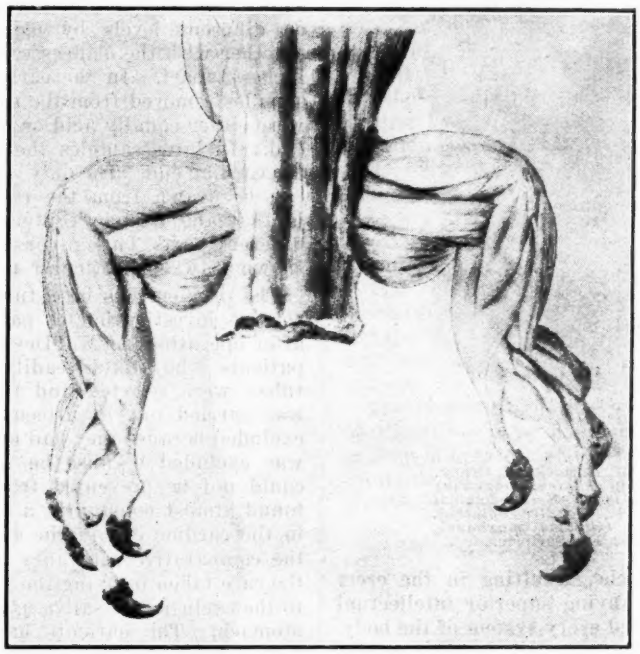


FIGURE X.
Showing Musculature of Hind Limbs of Australian Monitor (Iguana). Note the feeble gluteal development.

When infantile paralysis affects the upper limb, one of the first things complained of by the mother is that the arm hangs at the side and cannot be lifted up. This is a function only lately acquired and easily attacked; but as the development of this function was gradual, so we may find that whilst the child is unable to raise the limb standing, it may do so lying down and so we imitate Nature by reeducating from the lying down to the sitting up position. Or again, the mother may say her child is unable to stand or walk, having lost power in the extending muscle of the knee. Yet if we make the child lie on a table and bend the knee, it may be able to extend it perfectly. The *quadriceps extensor* muscle has the function possessed by the lowest mammal, the platypus, but has lost the additional functional entities that enable the patient to stand erect. These phenomena admitted of only one explanation, namely, that the attacks by infantile paralysis were revealing stages in the functional development of these muscles. They showed that their action was a complex function, one made up of several separate activities and hence the term "paralysis of muscles" is really referable to the loss of some, not necessarily all of their functions. The recovery, like the loss, follows in a biological or developmental sequence. The dominant factor is the erect position and the study of muscular action throughout the mammalia shows that orthograde functions have been superimposed on muscles

adapted originally for plantigrade motion only; new muscles have not been called into being. Thus reeducation must repeat the history of the acquisition of the functional entities of the muscle.

This applies not only to infantile paralysis, but to neuro-muscular disease in general. Furthermore,

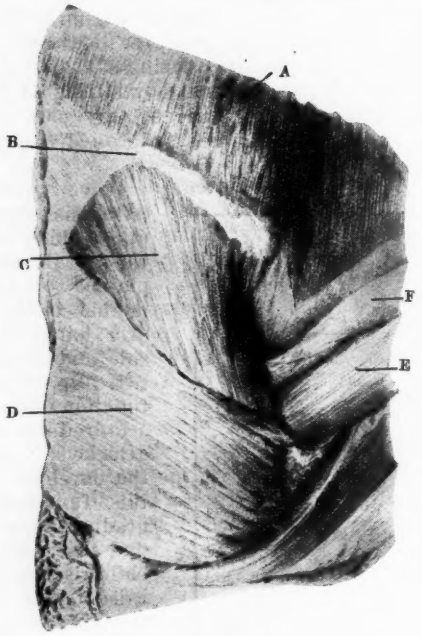


FIGURE XI.
Showing Muscles of Buttock of Orang. Note extensor of hip (*glutens maximus*) approaching human type. A = Abdominal Wall, B = Iliac Crest, C = *Messo-gluteus*, D = *Ecto-gluteus* (*Glutens maximus*), E = *Quadriceps*, F = Sartorius.

the great muscular epochs, resulting in the erect posture and its accompanying superior intellectual development, have affected every system of the body. The treatment of cardiac affection should consider the history of the acquisition of cardiac muscle function and similarly with problems of vision. Cell function is a compound of entities. Those last acquired are most vulnerable to attack and most difficult to regain and when, for example, we speak of failure of action whether of muscle, liver cell or heart, we have to determine is it an affection of some or all the functional entities. In my opinion it is along these lines that future medical textbooks must of necessity develope.

REGIONAL ANALYSIS OF THE STOMACH CONTENTS: A COMPARISON OF THE CARDIAC AND PYLORIC CURVES.

By Victor J. Kinsella, M.B., Ch.M. (Sydney), *Melbourne.*

In 1921 Gorham[1] and later Wheelon[2] showed differences in the acidity of the chyme removed from different regions of the stomach. Their method was to empty the stomach by rapidly withdrawing and then separately testing small samples of contents. In 1922 Kopeloff[3] removed the gastric contents by means of three tubes which were swallowed until the tips were 50, 45 and 40 centimetres from the teeth. He performed this experiment in three individuals and found that "the fraction taken from the tube inserted at 40 cm. is almost invariably lower in total and free acidity than the fractions taken at a depth of 45 or 50 cm." In 1926 Butcher[4] quoted an experiment in which he had removed a sample of gastric contents from the pyloric end and then withdrew the tube and removed a sample from the cardiac end. He found the acidity greater at the fundus by ten points. In 1927 Duthie[5] showed inconstant differences in the gastric acidity at different levels by using two tubes stitched together with the orifices twenty centimetres (eight inches) apart. In the early part of digestion the samples removed from the cardiac and pyloric ends were either equally acid or more acid at the pyloric end. In later samples the acidity was greater at the cardiac end. The only definite conclusion which can be drawn from the results of these workers, is that the gastric contents differ in acidity in different parts, but no constant difference has been shown between particular regions.

The problem has been further probed during the routine investigation of patients, both before and after operation, in Mr. Devine's clinic. Only those patients who could readily swallow the Einhorn tubes, were selected and the regional comparison was carried out in fifteen of these. Three were excluded because they had no free acid and a fourth was excluded because he salivated profusely and could not be prevented from swallowing. I have found almost constantly a higher degree of acidity in the cardiac end of the stomach and believe that the comparative constancy of my results is due to the care taken in fixing the position of the tubes and to the exclusion of saliva as far as possible from the stomach. The patients had dyspeptic symptoms, but in most of them organic disease of the stomach and duodenum was ruled out by clinical and X ray examination and in some cases at operation. In one case of duodenal ulcer and in another of cholecystitic adhesions there was no interference with the motor functions of the stomach.

Method.

Each patient swallowed two Einhorn tubes and the tips of these were so adjusted under the fluoroscopic screen that one lay at the cardiac end of the stomach, just below the gas bubble and the other came to rest at the junction of the horizontal and vertical parts of the stomach; that is, just proximal to the pyloric antrum. The tip of the lower tube could not very well be kept nearer the pylorus, because strong peristaltic waves would grasp it and attempt to force it through the pylorus stretching the rubber tubing until the grasp would relax and the tip would suddenly spring back into the body of the stomach. The tubes are inclined to curl up slightly in the gas bubble, but care must be taken to straighten them by withdrawing them

slightly, otherwise peristalsis will gradually alter their position. On two occasions I noticed that the cardiac and pyloric curves of acidity, at first well separated, began to approach each other as the experiment proceeded, until they coincided. I found that the tip of the upper tube had descended and lay alongside that of the lower. When the tubes have been correctly placed, they are fixed to the cheek by a broad strip of sticking plaster. Figure I shows the position of the tubes in relation to the distribution of the acid secreting cells. The distribution of these cells ceases abruptly at different points along the different curvatures. They cover 63·09% of the distance along the lesser curvatures and 81·55% along the greater (Radasch[6]).

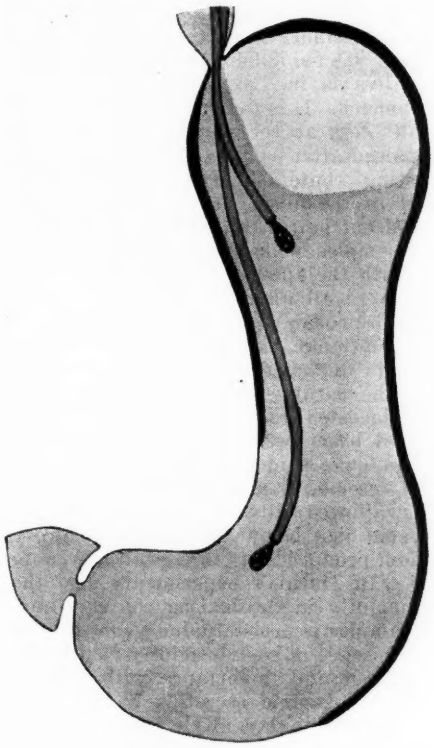


FIGURE I.

Showing the Position of the Tubes. The distribution of the acid secreting cells is represented by the heavy lines, which have been drawn roughly to scale from figures given by Radasch.

Ryle has suggested that the uneven distribution of acid found by previous investigators is probably due to the fact that the meal used by them was too thick to allow thorough mixing, so my patients were given a test meal of thin gruel.[7]

The patients were instructed to spit out or dribble their saliva into a bowl. In the early experiments two dental suckers were hung in the mouth, one on the lingual and the other on the buccal side of the teeth, but these proved irksome to the patients and were discarded in favour of a cork held between the front teeth. This device proved more effective and less trying. It prevented the patients from swallowing through inattention. They could thus read without anxiety and to a certain extent distract their thoughts from the test.

Samples were withdrawn every half hour, first from the cardiac then from the pyloric tube.

During the test and at the end the position of the tubes was checked by fluoroscopy.

Results.

One hundred and ten fractions of gastric contents were removed in this way and the corresponding pyloric and cardiac samples compared in each of the fifty-five pairs. See appendix for detailed findings.

In thirty-nine cases the free acidity was greatest at the cardiac end, the average difference being nineteen points of acidity.[1] Regurgitation, recognized by the presence of bile, obviously accounted, in part at least, for the difference in nine cases. In the remaining thirty the cardiac acidity was greater by sixteen points.

In ten cases the acidity was greater at the pyloric end. Six of these represented fasting contents. The average difference was nine points.

In six cases the acidities were equal and two of these were fasting contents and three were the first samples removed after ingestion of the meal.

The average free acidity in all samples, irrespective of the time after the meal, but excluding the fasting contents and the bile-stained samples, was forty-one at the cardiac end and thirty at the pyloric.

The comparative values at the different periods of digestion have been plotted graphically. The acidity is greatest at the pyloric end in the fasting contents; but in the digestive phase it is consistently greatest at the cardiac end (see Figure II).

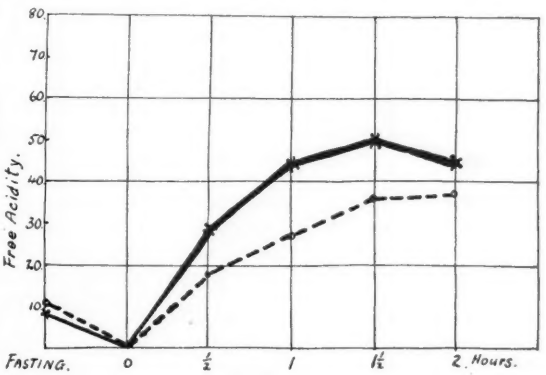


FIGURE II.

A Graph of the Average Acidities. The cardiac curve is represented by the continuous line and the pyloric by the interrupted.

The inorganic chloride content was estimated in ten pairs of samples. It was greatest at the cardiac end in three cases, equal in two and greater at the pyloric end in five. The average values were: 47 at the cardiac and 59 at the pyloric end.

[1] Throughout this paper, "points of acidity" refer to cubic centimetres of decinormal hydrochloric acid in one hundred cubic centimetres of gastric contents.

Bile appeared in twenty-five samples, five at the cardiac end and twenty at the pyloric end. The fasting contents account for nine of these. In the digestive phase bile appears sixteen times, three times in the cardiac and thirteen in the pyloric samples.

The saliva collected differed in quantity from a very small amount to 450 cubic centimetres. For neutralization it required on an average twenty-two cubic centimetres of decinormal hydrochloric acid per hundred cubic centimetres.

Discussion.

The above results show that at any given time during the digestive phase the acidity is almost constantly greater at the cardiac than at the pyloric end of the stomach. This difference holds in the early as well as in the late stages of digestion and is to be considered altogether apart from the general fall in acidity in the late stages. As the chyme moves onwards towards the pylorus, its acidity is gradually reduced. In a small number of samples this reduction was partly due to a regurgitation of duodenal fluids, but in the majority of cases there was no sign of regurgitation and the change must have been brought about by the activity of the pyloric glands. It has been shown that these secrete an alkaline fluid (Schafer[8]). This fact suggests that the operation of gastrectomy, when performed to reduce acidity, is not based on sound principles, when the part removed is mostly pylorus.

Regurgitation of duodenal fluids can be excluded in the majority of samples as the cause of the reduced pyloric acidity; first because the difference in acidity is seen just as well in the early stages of digestion when regurgitation is rare, as in the late stages when regurgitation is said to occur; secondly, because bile was present in but a small number of cases and bile can be accepted as an accurate index of regurgitation. It has been suggested that pancreatic juice may regurgitate without bile, but this is very unlikely because bile is continually present in the duodenum during digestion, being discharged, at least in laboratory animals, with each peristaltic wave (Pavlov,[9] Mann,[10] Copher and Kodama,[11] Cole,[12] Whitaker[13]). In man this continual outpouring of bile during digestion is suggested by the gradual emptying of the gall bladder after food, as shown by the Graham test and it is proved by the almost continual appearance of bile in the gastric contents when the stomach has been cut across in gastrectomy or Mr. Devine's "pyloric exclusion" and the cardiac end anastomosed end-to-side with the jejunum. This method of gastro-enterostomy produces the most thorough regurgitation. In a series of fourteen tests carried out after such operations I found strong bile staining in 68 of the 75 samples withdrawn. McBaird, Campbell and Hern drained the duodenum by continual suction through an Einhorn tube and their work bears out these conclusions.[14] Therefore, when there is no bile in the gastric contents, we can be practically sure that the duodenal fluids have been effectively prevented by the pyloric sphincter from regurgitating.

It has further been suggested that duodenal contents may regurgitate and the bile be masked by adsorption by the gastric contents.[15] But if 0·5 cubic centimetre of bile be added to 30 cubic centimetres of gastric contents removed after a gruel meal, a distinct bile staining is produced. The amount of bile-stained duodenal contents that could be masked by the gastric contents, must therefore be very small and of no account in neutralization. We can therefore safely conclude that duodenal contents are practically absent from the sample when there is no bile staining and that the fall in acidity in the absence of bile is due to dilution or partial neutralization by gastric secretion.

The importance of excluding the saliva in this regional comparison is at once suggested by the excessive salivation in many of the patients who swallow an Einhorn tube, and by the large amounts of saliva collected during these experiments. The viscid saliva is inclined to collect in the fundus of the stomach. It is for this reason that the acidity is usually less at the cardiac end in the sample first removed after swallowing the tubes, that is, in the fasting contents. One old gentleman, not included in the above survey, salivated profusely and could not be restrained from swallowing. The pyloric samples showed a normal curve of free acidity with the apex at 54 points, but the cardiac samples were all alkaline, opalescent and slightly viscid and probably almost pure saliva. In two of the exceptional instances of lower acidity at the cardiac end during the digestive phase the appearance of the cardiac samples and the presence of mucus suggested that an appreciable amount of saliva had been swallowed. In Kopeloff's experiments the lower acidity in the fractions taken from the tube inserted at forty centimetres, is no doubt due to swallowed saliva. The tip of this tube must have rested just below the cardiac orifice and the salivation produced by three tubes was probably profuse. In Duthie's experiments also the lower cardiac acidity in the fasting contents and in the earlier samples is probably due to swallowed saliva.

The difference in gastric acidity at different levels is of interest and importance with regard to the constancy of gastric secretion in the same individual from day to day. Ryle found that the curves of acidity following the ingestion of a gruel meal were practically constant, providing the test was carried out under constant conditions. The graphs of other observers have shown greater variations (Bell and MacAdams,[16] Duthie). The variations are usually not extreme and can easily be accounted for by an alteration in position of the tip of the tube during the test.

Summary.

1. The gastric contents are usually more acid at the cardiac than at the pyloric end of the stomach, providing that saliva is excluded. In some of the tests this was partly due to regurgitation of duodenal contents, but in the majority regurgitation played no part.

2. The observations recorded suggest that the stomach can modify the acidity of its own contents

and that the alkaline secretion of the pylorus is of importance in this respect.

3. Gastrectomy, with a view to reducing the secretion of acid, is not based on sound physiological principles, when the part removed is mostly pylorus.

4. Bile staining of the gastric contents is a reliable index of regurgitation because the duodenal contents are constantly bile stained during digestion and bile pigments are not masked in the gastric contents to any appreciable extent. It can therefore be concluded that a fall in acidity in the absence of bile is not due to regurgitated duodenal fluids.

APPENDIX.

CARDIAC SAMPLES.

Patient Number.	Fasting.	Half Hour.	One Hour.	One and a Half Hours.	Two Hours.	Two and a Half Hours.	Three Hours.
1	0	41	49	43	—	—	—
2	7	33	37*	39*	40*	—	—
3	11*	36*	—	—	—	—	—
4	0	16	58	67	50*	—	—
5	0	35	63	—	54	—	69
6	21	62	47	51	38	—	—
7	0	5	14	3	0	6	—
8	28	41	46	69	77*	55*	—
9	0	0	10	29	54	50*	48
10	24	42	71	89	82	41	42
11	7	18	34	—	—	—	—
Average	8·7	29·2	43·6	50	45·6	23·5	53

PYLORIC SAMPLES.

Patient Number.	Fasting.	Half Hour.	One Hour.	One and a Half Hours.	Two Hours.	Two and a Half Hours.	Three Hours.
1	9	11	28	32	—	—	—
2	11	33	9*	12*	5*	—	—
3	0*	9*	—	—	—	—	—
4	8	10	31	21	11*	—	—
5	5	28	55	—	48	—	61
6	17	32	62	49	31	—	—
7	0	0	11	5	0	3	—
8	7	9	18	58	54*	12*	—
9	0	0	0	23	39	24*	23
10	35	42	40	67	67	71	46
11	12	12	2	—	—	—	—
Average	10·4	17·8	27·4	36·4	37	37	43

* The pairs of samples marked with an asterisk have been omitted on account of bile staining, usually in the pyloric fraction.

References.

(1) F. D. Gorham: "Variations of Acid Concentration in Different Portions of the Gastric Chyme, and its Relation to Clinical Methods of Gastric Analysis," *Archives of Internal Medicine*, April, 1921, page 434.

(2) H. Wheelon: "Relation of the Gastric Content to the Secretory and Motor Functions of the Stomach," *Archives of Internal Medicine*, November, 1921, page 613.

(3) Nicholas Kopeloff: "Variations in Aliquot Fractions of Gastric Contents," *Archives of Internal Medicine*, July, 1922, page 118.

(4) I. A. Butcher: "Observations on the Gastric Acidity and Secretion in Health," *Quarterly Journal of Medicine*, July, 1926, page 455.

(5) R. J. Duthie: "Fractional Analysis of the Gastric Contents," *Quarterly Journal of Medicine*, April, 1927, page 265.

(6) H. E. Radasch: "A Manual of Histology," 1924, page 285.

(7) J. A. Ryle: "Gastric Function in Health and Disease," 1926.

(8) E. A. Schafer: "Text Book of Physiology," 1898, Volume I, page 532.

(9) I. P. Pavlov: "The Work of the Digestive Glands," 1910.

(10) F. C. Mann: "The Functions of the Gall Bladder," *Physiological Reviews*, April, 1924.

(11) G. H. Copher and S. Kodama: "The Regulation of the Flow of Bile and Pancreatic Juice into the Duodenum," *Archives of Internal Medicine*, November, 1926, page 647.

(12) W. H. Cole: "Relation of Gastric Content to the Physiology of the Common Duct Sphincter," *American Journal of Physiology*, March, 1925, page 39.

(13) L. R. Whitaker: "The Mechanism of the Gall Bladder," *American Journal of Physiology*, October, 1926, page 411.

(14) M. McBaird, J. M. H. Campbell, J. R. B. Hern: "The Importance of Estimating Chlorides in the Fractional Test Meal Samples and Some Experiments with the Duodenal Tube," *Guy's Hospital Reports*, January, 1924, page 23.

(15) P. B. Hawk and O. Bergeim: "Practical Physiological Chemistry," 1926.

(16) J. R. Bell and W. MacAdam: "The Variations in Gastric Secretion of the Normal Individual," *Quarterly Journal of Medicine*, April, 1924, page 215.

OBSERVATIONS ON THE FLORA OF THE MALE GENITAL TRACT IN DISEASE.

By NORMAN M. GIBSON, O.B.E., M.B. (Sydney),
Honorary Assistant Medical Officer to the Venereal Department, Royal Prince Alfred Hospital, Sydney,

AND

C. J. WILEY, M.B. (Sydney),
Honorary Assistant Medical Officer to the Venereal Department, Royal Prince Alfred Hospital, Sydney; Honorary Surgeon for Venereal Diseases, Royal North Shore Hospital of Sydney.

INFLAMMATORY conditions affecting the genital tract are, at any rate at the commencement, usually due to the gonococcus.

Owing to the serious and far-reaching effects of gonorrhœa and its insidious character the laboratory examinations that are undertaken, have reference in most cases to the presence or absence of the gonococcus.

Primary infections of the urethra with organisms other than the gonococcus, however, do occur and, while the gonococcus is not usually found in combination with other organisms, it is not uncommon to find that as the former disappears, the latter make their appearance.

There is no doubt that organisms other than the gonococcus are capable of initiating an inflammatory condition of the urethra and its adnexa or of giving rise to a chronic inflammation following in the wake of gonorrhœa and attended by both local complications, such as vesiculitis, epididymitis *et cetera*, or metastatic complications, as arthritis or fibrositis.

It cannot be said, however, that the field is fully explored. Bacteriological methods will not reveal all cases of gonorrhœa and in this respect it may be well to mention that the gonococcus complement

fixation test as a diagnostic aid and a criterion of cure will be found of the greatest value.[1]

The *glans penis*, coronal sulcus and inner surface of the prepuce in the normal individual always harbour a certain number of organisms which varies according to the anatomical structure of the prepuce and the cleanliness of the individual. Where there is a long and phimosed prepuce, the number of organisms may be very large. Those commonly found are the staphylococcus, a Gram-positive diplococcus, *Bacillus xerosis* and the smegma bacillus.

If the accumulation of glandular secretions and waste epithelial products is considerable, spirochætes may be found, also a spirillum. Under these conditions we have noted *Spirochæta refringens*, *Spirochæta gracilis* and *Spirochæta balanitidis*.

With the exception of the *fossa navicularis*, the urethra and its adnexa may be regarded as sterile. Owing to the organisms abounding on the exterior, careful washing of the *glans penis* with soap and water and spirit should precede the taking of specimens. Cultures of urine and of expressed contents of the seminal vesicles and prostrate gland are sterile as a rule, but occasionally growths of staphylococci, Gram-positive diplococci and diphtheroids are obtained and this is doubtless due to the fact that the *fossa navicularis* normally contains a few organisms which are not removed by the washing prior to culture.

It was long ago pointed out by Pfeiffer[2] and by Von Stanziale[3] that the most anterior portion of the urethra contains non-virulent white staphylococci and polymorphic, non-virulent bacilli of the diphtheria group, a similar condition to that which obtains in the surrounding skin. These organisms also preponderate in the normal flora of the conjunctiva, of the nose and of the external ear.[4]

It is worthy of note that the *fossa navicularis* is lined by stratified epithelium, whereas the anterior portion of the urethra is lined by columnar epithelium. The latter is apparently an unfavourable soil for the growth of the organisms mentioned above, which normally inhabit the exterior. In urethral inflammations the altered conditions permit of the entrance of these organisms. In the vast majority of cases they appear in the declining stages of gonorrhœa, a circumstance which may be due to the alteration of the mucous membrane by the inflammatory process. In old chronic inflammatory conditions it is worthy of note that the columnar epithelium may be transformed into stratified epithelium.

Remarks on Technique.

In order to interpret results correctly a few remarks on technique may not be out of place. Owing to the numerous flora surrounding the orifice of the urethra, it is important to wash the exterior, a matter which has already been referred to. The inflammatory products from the anterior portion of the urethra appear at the meatus as a discharge, but those from the posterior portion of the urethra, taking the path of least resistance, pass into the bladder. The urine therefore contains inflammatory products from both portions of the urethra as well as from the whole urinary tract. For examination of the urine the patient is made to urinate into a sterile flask, a portion of this fluid is at once centrifuged and the deposit examined by smear and culture.

Cultures are made on plates rather than slopes, as some of the organisms encountered are very rapid in their growth, so that others which grow more slowly or are present in small numbers, are apt to be overgrown. Urine deposits and vesicular and prostatic expressions for examination in film are best dried at room temperature, but in the former various salts present may interfere considerably with staining. Löffler's methylene blue is the most satisfactory single stain.

As the differentiation of gonococci is the usual purpose of bacteriological examination of urethral specimens, Gram's method of staining is usually employed and gives the most consistent results. We formerly used Jadassohn's modification which gives a clear contrast, but as Jensen's modification does away with anilin oil and is more convenient, we have used it for some years past and consider it the most satisfactory method.

It is of great importance that films should be spread out thinly and evenly, otherwise ambiguous results may be obtained. Among the Gram-negative bacteria the gonococcus most rapidly loses its colour. It is completely decolorized when the cell nuclei and mucin in the film are still blue. None of the other Gram-negative organisms gives up the colour so rapidly, a fact originally pointed out by Hogge.[5]

A common source of error is that with any modification of Gram's method of staining, if not most carefully employed, some of the Gram-positive cocci may be decolorized. It has to be remembered that the distinction between Gram-positive and Gram-negative organisms is a more or less arbitrary one decolorized by the alcohol employed in the decolorizing process than others. For example, the Gram-positive diplococcus which is so commonly found in chronic urethral discharges, is easily decolorized and has some morphological resemblance to the gonococcus.

Primary Infections of the Urethra.

Gonococcal Infections.

The commonest disease-producing organism is, of course, the gonococcus. It causes more damage than any other organism and the effects of infection are more far reaching. In contradistinction to other invaders, it attacks the genital area only. No case of gonococcal cystitis involving the whole bladder surface or of gonococcal pyelitis in the male has been observed by us.

A gonococcus is to be recognized not only by its shape, but by its characteristic grouping. In acute gonococcal discharges most of the pus cells are free from organisms, but every twentieth or fiftieth cell is literally stuffed with them. Later on the arrangement is less characteristic, as the organisms

tend to become extracellular and involution forms occur. This is the stage at which secondary invaders make their appearance. Therefore in examinations for gonococci a plate culture usually gives most information.

Non-gonococcal Infections.

Primary infections of the urethra with organisms other than gonococci in persons who have never had gonorrhœa, are relatively uncommon. Clinically they are as a rule distinguished by a long incubation period and a scanty discharge. On microscopical examination of smears of the discharge the causative organism is usually apparent. The gonococcus may be definitely excluded by examination of smears, cultures and by a number of observations of the results of the gonococcus complement fixation test. The infection may spread to the prostate gland, seminal vesicles and epididymis and considerable damage is to be apprehended from extension to the bladder and pelves of the kidneys. Non-gonococcal inflammatory conditions of the urethra in patients who have had gonorrhœa, are, on the other hand, not by any means uncommon. These, however, are not primary infections, but a reinfection of the urethra by organisms from an uneradicated focus of secondary invaders.

Inflammatory conditions sometimes follow the use of overstrong solutions injected by the patient as a prophylactic against venereal infection. The discharge is at first sterile, but subsequently various organisms may extend into the urethra and establish themselves on the injured mucosa.

A contributory factor is the use by the patient of an unsterilized syringe. This is the commonest cause of non-gonococcal urethritis and is a procedure involving great danger.

Primary infections of the urethra with organisms other than the gonococcus are in our experience most frequently due to the staphylococcus and the *Bacillus coli*. Not infrequently they occur in combination. A Gram-positive diplococcus occurs rarely as the only organism in the discharge. In two instances we have noted the *Streptococcus brevis* as the causal organism. Non-gonococcal infections may involve the prostate gland, seminal vesicles and epididymis and may also cause cystitis and pyelitis. These two latter conditions, in our experience, are in the male never due to the gonococcus.

Conditions Favouring the Entrance of Secondary Invaders.

Gonococcal infections are invariably pure at the commencement. Smears and cultures show the gonococcus only. It is not uncommon, however, to find that after a certain period of treatment other organisms appear in the urethra.

It is said that Professor John Chiene, of Edinburgh University, used to tell his students: "The gonococcus is a typical Scotsman. It is a pioneer, a colonist which settles down and renders the soil suitable for other breeds to follow."[6] In the latter stages of the gonococcal infection it is not uncommon to find other organisms in specimens taken from the urethral discharge.

The gonococcus does not thrive in the presence of intruders and therefore it frequently happens that the original causal organism dies out, leaving behind a secondary infection. There is no doubt that faulty methods of urethral injection and irrigation and unsuitable solutions are responsible for a proportion of cases of secondary infection. When a thoroughly aseptic technique is employed, secondary infection is reduced to a minimum. In army treatment centres during the late war secondary infections were notably frequent. Strong antiseptic solutions have the effect of injuring the mucous membrane and lowering its local resisting power.

Quite apart from the above consideration, antecedent gonococcal inflammation would appear so to damage and alter the mucous lining that organisms which are normally inhabitants of the exterior, gain an entrance to the canal.

The significant clinical features are the persistent character of these infections and the possibility of extension to the bladder and pelvis of the kidney.

Secondary Organisms Found in Gonorrhœa.

The particulars hereunder relate to the organisms isolated following examination of the urethral discharge and urine as previously described.

The staphylococcus is the commonest organism encountered. There is considerable difficulty in classifying the various cocci encountered as, although types occur, the classification is limited by the occurrence of intermediate varieties in which sometimes one characteristic, sometimes another is prominent. Both large and small staphylococci are found and also intermediate sizes. Different sized cocci may appear in the same preparation. This organism is always definitely Gram-positive, but when lying within cells and partly disintegrated, it may lose the violet stain and by appearing Gram-negative cause confusion. Various of the organisms enumerated hereunder may occur in association with staphylococci, notably Gram-positive diplococci and diphtheroid bacilli. Growth occurs on all common media, even if weakly acid, at room temperature or in the incubator.

A Gram-positive diplococcus, morphologically resembling the pneumococcus, is very commonly met with and may be found both within and without the cells, especially epithelial cells. It grows profusely on both plain agar and glucose serum agar. As the growth developes, it causes clouding of the medium and if gonococci are present in very small numbers owing to the comparative slowness of their growth, they are likely to be overgrown and obscured. This organism is weakly Gram-positive and is apt to be decolorized by the alcohol used in Gram's method of staining. Consequently Gram-positive diplococci lying within the leucocytes may give the impression of being gonococci. The cocci are arranged in pairs and are generally elongated, being slightly pointed at the ends. Some forms may be unusually elongated, forming in effect a diplo-

bacillus. At the other extreme are short rounded forms. Occasionally single large involution types occur. Furthermore these large involution types occur in chains forming strepto-diplococci. A capsule may be distinguished when a slide preparation is stained with an anilin dye and examined in water, but when stained by Gram's method it is less readily seen.

The *Micrococcus tetragenus* has been present on a few occasions. The individual cocci are large and in direct smears are found arranged in groups of four or tetrads. An irregular capsule is frequently present. In cultures the tetrad form is less readily seen. On glucose serum agar growth appears as white colonies which become confluent and form a creamy white viscous layer.

Various rod-shaped organisms, more or less resembling the diphtheria bacillus, are frequently present. There is, however, no general pathogenicity for guinea pigs, even when large doses are injected subcutaneously.

The commonest type is that described by Hofmann and Löffler. It is Gram-positive and, when grown on serum, has a tendency to be shorter and thicker. The tendency to the formation of club-shaped bodies and to segmental staining is slight. The bacilli tend to lie parallel to one another. It grows much more vigorously than the diphtheria bacillus, a thick greyish-white scum spreading over the surface of the medium. Later the agar often becomes brown.

Another type, the xerosis type, is very similar in appearance to the diphtheria bacillus, but in young cultures short thick forms are more commonly seen. In late cultures the involution forms are very distinctive and marked clubbing is present. On glucose serum agar it produces circular colonies with serrated margins which adhere so closely to the medium that they are difficult to wash away completely. Under magnification the colonies appear freely granular. Different strains vary greatly in their size, but they never approach the Hofmann-Löffler variety in point of size.

The exact differentiation of the varieties above described is sometimes rendered difficult by the occurrence of variable strains which resemble each type in one particular or another. Although further subdivision has been attempted, we think that this is artificial.

Streptococci are relatively infrequent. There is variability in regard to the size of the individual cocci and also in regard to their arrangement. Within the pus cells the cocci may lie together after the manner of staphylococci. Streptococci, if present, usually occur alone and therefore their differentiation from other organisms is not difficult. Pneumococci sometimes form chains, but they are short and individual cocci, having a typical lancet shape, are always to be found. Streptococcal chains, on the other hand, are formed of rounded or flattened cocci. On glucose serum agar they form round grey surface colonies of transparent colour with sharp margins and very little tendency to coalesce. The borders may have fine radial striations. An opacity is finally produced in the medium.

Bacilli of the colon group are present in an appreciable proportion of cases. They are short rods with rounded ends, without capsules, 0·7 to 0·8 μ broad, 1 to 3 μ long, occurring singly or in pairs and rarely in longer formations. The smallest rods look like cocci. These organisms are sometimes feebly motile and are Gram-negative. Growth takes place on all media, even at room temperature. On agar it forms a greyish-white glistening transparent scum and on glucose serum agar it produces clouding of the medium. Growth is often accompanied by an unpleasant fæcal odour.

The *Diplococcus magnus* of Rosenthal is infrequently met with, occurring in about 1% of cases. It is Gram-negative, but is not so readily decolorized as the gonococcus. It is easily distinguished from this organism in smears, however, as it is four times larger. Growth occurs readily in glucose serum agar, forming a thick yellow scum; no clouding of the medium is produced. As illustrating the similarity of the flora of the male and female genital passages Gurd[7] found this organism once in 113 cultures and smears from the female genital area.

A short Gram-negative bacillus is occasionally present. This organism frequently occurs in pairs. It grows well on serum glucose agar, but degeneration soon begins with the formation of variable involution forms.

References.

(1) N. M. Gibson and C. J. Wiley: "The Clinical Significance of the Complement Fixation Test in Gonorrhœa," The Medical Journal of Australia, June 9, 1923, page 635.

(2) H. Pfeiffer: *"Ueber Bakterienbefund in der normalen männlichen Urethra und den Syphillis Bazillus Max Josephen," Wiener Klinische Wochenschrift,* 1903, *Band* XVI, *Seite* 762.

(3) Stanziale: *"Die Bakteriem der Harnröhre inter normalen Verhaltnisse und bei Gonorrhöe," Zentralblatt für Bakteriologie; Orignale,* 1906, *Band* XLII, *Seite* 19.

(4) K. Supsle: *"Ueber spirohäten-ähnliche Gebilde in Vaccinlymphe," Zentralblatt für Bakteriologie; Orignale,* 1905-6, *Band* XL, *Seite* 495.

(5) Hogge: *"Annales des Maladies Genito-urinaire,"* 1893.

(6) D. Thomson: "Gonorrhœa," 1923.

(7) T. B. Gurd: "Bacteriology of Female Genital Tract," *Journal of Medical Research,* 1908, Volume XVIII, page 291.

SYMPATHETIC TRUNKSECTION: A NEW OPERATION FOR RAYNAUD'S DISEASE AND SPASTIC PARALYSIS OF THE UPPER LIMB.

By Norman D. Royle, M.D., Ch.M., F.C.S.A.,

Honorary Orthopædic Surgeon, Lewisham Hospital; Honorary Orthopædic Surgeon, State Children's Relief Board, New South Wales.

The relief obtained by patients suffering from Raynaud's disease or from spastic paralysis of the upper extremity after sympathetic ramisection has been performed, is never so complete as that obtained when the lower extremity is affected and a similar operation performed. In the case of Raynaud's disease I suggested that structural changes in the blood vessels of the upper limb were

responsible for this partial failure. In spastic paralysis the less favourable results in the upper limb were accounted for by the suggestion that the upper limb had a more close relationship to consciousness and that finer movements were demanded of it. Both of these suggestions I find now to be incorrect. The poor results were due to the fact that in an ordinary ramisection for affections of the upper limb a sufficient number of the sympathetic rami were not divided. I have therefore devised a new operation whereby a greater number of the sympathetic connexions of the brachial plexus are interrupted.

The Operation.

An incision is made across the insertion of the sterno-mastoid into the clavicle and extends five to eight centimetres upwards and outwards (see Figure I). The sterno-mastoid is exposed and partially divided, thus giving access to the *scalenus anterior* muscle. If necessary, the omo-hyoid is retracted upwards. The *scalenus anterior* muscle is then well defined (see Figure II). A blunt-pointed instrument is passed behind the *scalenus anterior* muscle and in front of the lower trunks of the brachial plexus. This allows access to the upper part of the thoracic cavity. In some cases the subclavian artery must be retracted upwards, but it usually does not present any difficulty in the dissection. With a finger the first thoracic nerve is traced downwards into the thorax and if the palmar surface of the finger is placed on the first thoracic nerve, the nail will lie against the sympathetic trunk as it crosses the neck of the first rib. A strabismus hook may be passed around it.

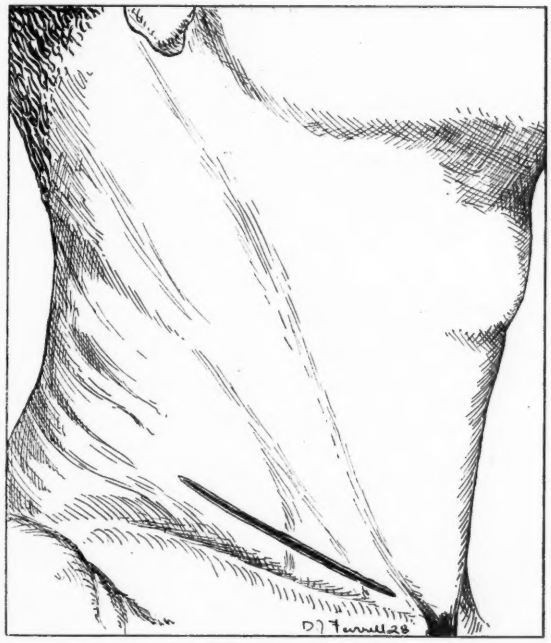


FIGURE I.
Showing Line of Incision.

The Point of Division of the Sympathetic Trunk.

If the sympathetic trunk is divided below the first thoracic ganglion, some of the fibres going to the eye will be left undisturbed and for this reason Horner's syndrome will not usually appear. On the other hand, if the trunk is divided in this position, the majority of the fibres going to the upper limb are interrupted and a maximum result is obtained with the minimum of untoward result to the eye. The actual point of division is between the first and second rib or it may be even as low as the lower edge of the second rib, according to the position of the *rami communicantes* to the first thoracic nerve (see Figure III).

Method of Division of the Sympathetic Trunk.

When the sympathetic trunk is held up on one strabismus hook, it may be avulsed in sections with another hook. This is a far safer plan than the introduction of a cutting instrument into this small space. If the space be not large enough, the *scalenus anterior* muscle may be divided, but this is seldom necessary, provided the muscle is freely exposed in the neck and well retracted. In introducing the finger behind the *scalenus anterior* Sibson's fascia must be broken. This exposes the parietal layer of pleura which can be packed away gently with a small sponge.

A good light, preferably a shadowless light or a spot light, directed right into the wound is essential. The operation is by no means easy and should not be undertaken by anyone who is not familiar with the position of the sympathetic trunk and its connexions. An abnormally quick return in circulation after pressure on the patient's fingers or hand will indicate that the sympathetic trunk has been divided.

The Explanation of Previous Failures from Cervical Sympathetic Ramisection in Raynaud's Disease and Similar Conditions.

Various authors have reported failure of ramisection and also of cervical sympathectomy to relieve Raynaud's disease of the upper extremity. In other methods in which the approach to the sympathetic trunk is made antero-medially to the sterno-mastoid, difficulty may be experienced in reaching a point as low as the superior thoracic ganglion and this may account for some of the failures reported. The explanation of these failures is then to be found in the incompleteness of the operation. When the operation is complete the behaviour of the upper limb does not differ from that of the lower limb after division of the sympathetic nerves. The following case illustrates this point:

The patient, E.L., a woman of thirty-eight years, had suffered with pain and numbness in the fingers and feet for about twelve years. The condition was becoming gradually worse. In winter time the hands were very painful and in the patient's own words: "The feet went

dead and ulcerated." When interrogated, the patient stated that her hands and feet manifested the white, red and blue sequence of changes. Her reflexes were exaggerated and sustained. This is the usual condition of the reflexes in Raynaud's disease and is due to the increased activity of the sympathetic nervous system in the limbs. Her systolic blood pressure was 140 millimetres of mercury the diastolic 100 millimetres. When examined the toes and fingers were blue. A feeble pulse could be felt on the dorsum of the foot and in the posterior tibial artery. A diagnosis of Raynaud's disease was made.

Sympathetic ramisection entirely relieved the condition of the lower limbs, but the operation on the upper limb, performed according to my former method, was not entirely successful. The pain and blueness returned after an interval of some days.

Two years later the right thoracic sympathetic trunk was divided below the first thoracic ganglion in the manner described in this paper. This produced a decided contrast in the condition of the hands. The left remained cyanotic and cold, the right became warm and showed a normal colour. The patient obtained complete relief from pain and discomfort. A month later the left thoracic sympathetic trunk was removed and this led to a satisfactory change in the left upper limb.

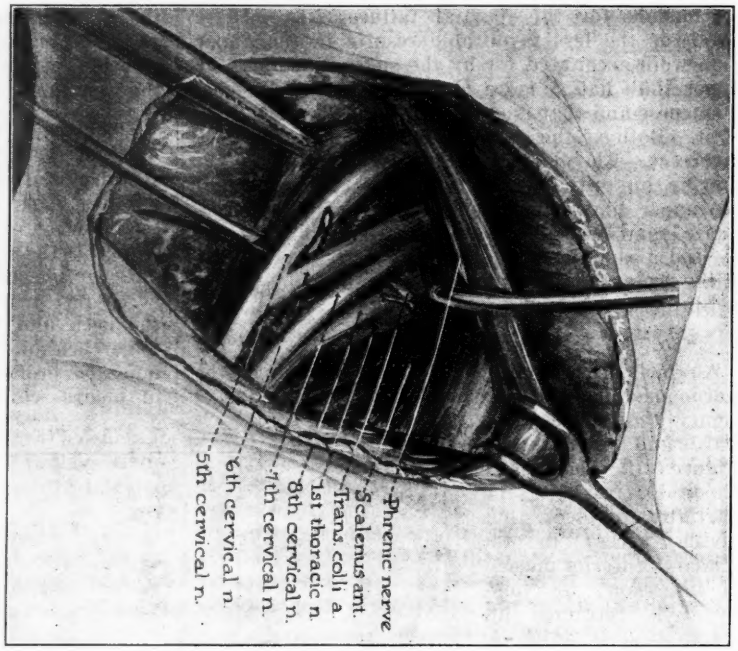


Figure II.
Dissection, Showing the Relations of the *Scalenus Anterior*.

It is interesting to note that the previously performed sympathetic ramisection produced a temporary ptosis and contraction of the pupil, due to division of the rami of the first thoracic nerve, but the subsequent division of the sympathetic trunk did not have any apparent effect. In spite of the section of both sympathetic trunks in the thorax, there was no alteration in the pulse rate. The patient is completely free from the symptoms and signs of Raynaud's disease. The circulation has been restored and her hands present a normal shade of pink. The operation on the right upper limb was performed on May 24, 1928, and that on the left upper limb on July 3, 1928.

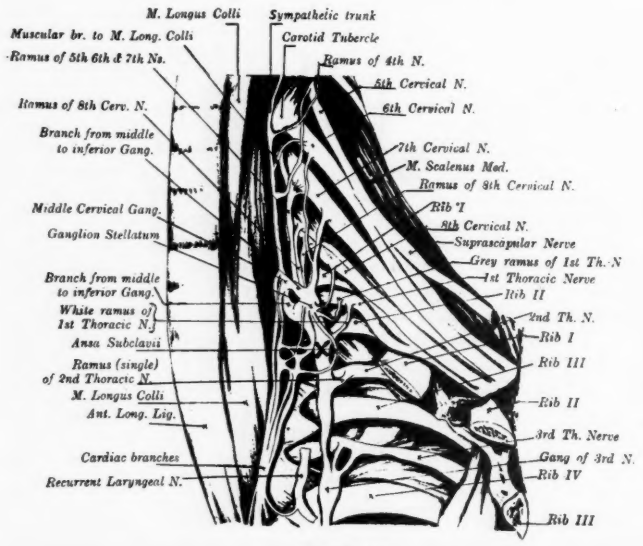


Figure III.
Dissection of Lower Cervical and Upper Thoracic Portions of Sympathetic Nervous System on the Left Side. The *scalenus anterior* muscle has been removed. The dissection is viewed from in front and to the side (after Potts). The point of division of the thoracic sympathetic is marked with a cross.

The Application of this New Operation to Spastic Paralysis of the Upper Limb.

More successful results in spastic paralysis in the upper limb may be obtained if this operation of sympathetic trunksection is adopted.

This statement is illustrated by the following case:

The patient, a man aged thirty-four, had sustained a gunshot wound in the left frontoparietal region twelve years previously. Speech was slow and hesitating and the patient was unable to relax the biceps and triceps adequately. He could not adduct or abduct his fingers and he could not oppose the thumb and little finger. In other words he had no control of the intrinsic muscles of the hand. He had noticed an increase in the rigidity both of upper and lower limbs on the paralysed side during cold weather. Balance on his right lower limb was poor, but was better in the summer time. There was some degree of retardation of relaxation of the knee jerk on the right side, but the patient could walk well on his right lower limb. The reflexes were normal on the left side. There were vaso-motor disturbances on the right side. The fingers of the right hand were blue and cold, those of the left hand warm and pink. The Babinski reaction was not elicited in either lower limb.

Sympathetic trunksection as described above was carried out on July 3, 1928. The next day the patient was able to oppose his thumb and little finger and a week later he had gained control of the intrinsic muscles of the hand. The sister who

had had charge of him for many months, said there was a tremendous improvement in the whole right upper limb. The patient was well satisfied with the result of the operation and is continuing to improve.

Reports of Cases.

ADENO-CARCINOMA OF THE KIDNEY.[1]

By S. GARDINER, M.B., Ch.M. (Sydney),
Honorary Surgeon, Newcastle Hospital, Newcastle, New South Wales.

A.J. WAS brought to hospital complaining of "stomach ache" for five days. The night previous to admission he also complained of pain in the scrotum and the mother noticed for the first time a swelling of his left testicle and a "lump" in the left side of the abdomen. Up to four days before admission the child had been in good health, bowel movement had been regular and urination normal and no loss of weight had occurred.

On examination a large hard mass, not tender on palpation, occupied the whole of the left side of the abdomen and bulged out the left lumbar region. Definite left varicocele was present. The urine was acid; it contained a trace of albumin, but no blood and no casts; an occasional pus cell was seen.

A blood count gave the following results:

Erythrocytes, per cubic millimetre ..	3,850,000
Hæmoglobin value	80%
Leucocytes, per cubic millimetre	17,500
Polymorphonuclear cells	80%
Small lymphocytes	12%
Large lymphocytes	5%
Large mononuclear cells	3%

X ray examination and clinical examination led to a pre-operative diagnosis of kidney neoplasm.

At operation the left kidney together with a large regular circular tumour 12·5 centimetres (five inches) in diameter, attached by its circular base, six millimetres (one-quarter of an inch) in diameter, to the centre of its anterior surface, was removed with some difficulty through a transperitoneal incision.

Dr. Byrne reported the tumour to show the structure of embryonal adeno-carcinoma—a rare variety of renal carcinoma.

The patient left the hospital in good general condition three and a half weeks after operation.

Comment.

The varicocele in this particular case was evidently due to direct pressure on the left spermatic vein and not to a tumour thrombus in the renal vein obstructing the return flow from the left spermatic vein.

I found the literature on malignant neoplasia of the kidney occurring in infancy rather scanty.

Magoun and MacCarty[(1)] report seven cases. Six of the patients were females and one was a male; the eldest was seven years and the youngest twenty months of age. The growth was situated on the right side in five instances and on the left in two.

Three views with regard to pathogenesis have been maintained: That the tumours are derived (i) from the Wolffian body, (ii) from the embryonic kidney or (iii) from aberrant cells of the myotome or other similar structures. Kretschmer[(2)] states:

> Malignant tumours of the kidney in children are rare. As a rule, they generally are rapid growing and because of the rapid growth they cause the death of the little patients at an early date. They occur with great predilection in the first five years of life and are not commonly found after the eighth year. Steffen found 219 cases, 168 in the first five years of life, 134 of which occurred in the first year. There was apparently no difference in the occurrence in the sexes.

[1] Read at a meeting of the Newcastle Hospital Clinical Society on July 5, 1928.

References.

(1) J. A. H. Magoun and W. C. MacCarty: "Malignant Neoplasia of the Kidney Occurring in Infancy," *Surgery, Gynecology and Obstetrics*, Volume XXXVI, 1923, page 781.
(2) H. L. Kretschmer: "Urologic Problems in Infancy and Childhood," *Journal of Urology*, November, 1927, page 433.

TORSION OF THE FALLOPIAN TUBE.

By L. S. WOODS, M.B., B.S. (Melbourne),
Honorary Surgeon, Albury Hospital, New South Wales.

A WIDOW, aged thirty-five years, was admitted to hospital on January 5, 1928, complaining of pain in the right side of the lower part of the abdomen. The pain had come on suddenly six days previously, was severe at the onset and had never entirely subsided, being colicky in nature. She had had some nausea and dry retching during that time. The bowel actions had been normal. Three days previously there was some scalding pain on micturition, there was no frequency or hæmaturia.

Her last period had occurred six weeks before. The periods were always irregular, but not painful. She lost a medium quantity and the duration was about five days. She has one child two years old; there had been no miscarriages.

Examination revealed that her temperature was 37·5° C. (98·6° F.), her pulse rate was 86. There was slight rigidity and tenderness of the right lower part of the abdomen, especially just below McBurney's point. *Per vaginam* a large tender cystic mass was palpated in the pouch of Douglas. The provisional diagnosis was acute salpingitis or tubal pregnancy.

Under ether anæsthesia, given by the open method, the abdomen was explored through a median infraumbilical incision. The pelvic organs were palpated and the mass was delivered. It proved to be the right tube which was twisted on itself about three times close up to the uterine end. It was dark red and engorged, the size of a large orange and free except for a small recent adhesion to the right ovary. The twisting was easily undone and right salpingectomy was performed. The vermiform appendix which had been lying in proximity to the mass was congested and its removal was therefore undertaken. The abdomen was closed without drainage. Convalescence was uneventful.

After operation the tube was examined by slitting from the uterine end towards the ostium. Inside the tube, adherent at one point to the wall, was a cyst about the size of a hen's egg. On the outside the cyst wall was white and on the inside it was black and shiny. It was full of clear watery fluid.

Comment.

Apparently torsion of the Fallopian tube is a rare occurrence. Doubtless others have been reported, but at present I can trace only six other case records.

Bibliography.

J. J. Wells: "Volvulus of the Fallopian Tube," *Journal of the American Medical Association*, July 5, 1924, page 30.
P. R. Michaël: "Torsion of a Normal Fallopian Tube," *Nederlandsch Tijdschrift voor Geneeskunde*, December 6, 1924, page 2828; abstracted in "Epitome of Current Medical Literature," supplement to *The British Medical Journal*, March 14, 1925, page 51.
D. J. Davies: "Torsion of Fallopian Tube," *The British Medical Journal*, April 4, 1925, page 657.
J. C. Jefferson: "Torsion of Fallopian Tube," *The British Medical Journal*, January 9, 1926, page 55.

Reviews.

MEDICAL WORK IN SCHOOLS.

THE increased attention that school medical work is receiving in the United States of America in common with other civilized countries, is well shown in "Health Supervision and Medical Inspection of Schools," by Thomas D.

Wood and H. G. Rowell, both associated with the Teachers' College, Columbia University, New York.[1] A very thorough treatment is given of the practical duties of the school medical officer and approved samples of examination cards and methods of procedure are very fully recorded. The difficult subject of malnutrition in school children is well handled and an excellent account given of the needs of children as regards special education. The recognition, supervision and organization of special classes include not only the usual types of feebleminded, deaf, nearly blind and malnourished children, but also children with cardiac affections, epileptics and "gifted" children. A peculiar American note is shown in appraisal forms as to the relative values of various health activities and findings and in the chapters on health publicity and flat feet and orthopœdic defects. Mental and social hygiene, health supervision and care of the preschool child and of the child in industry are also unusual features which are well treated.

The book is essentially practical in outlook and the various technical features of examination and organization demonstrate the experienced and well-informed selective ability of the authors. As is natural in a community of over one hundred million people, of very varying degrees of culture, with a remarkable mixture of races and of social conditions varying from the primitive up to the most advanced degrees of civilization, the standard of the work done in America is of very unequal character. In Wood and Rowell's book we may visit the high spots. They may fairly claim that every procedure they are applying has been well tried. The data they give allow the reader to select for himself the methods best adapted to his own local circumstances. Hence this book should be of the greatest value to all school medical officers and is particularly to be recommended to practising members of the profession who may be called upon to act as school physicians to private (primary or secondary) schools. To these the chapter on communicable diseases will also be of considerable help. It may safely be stated that the two best books for reference as to school medical work which the school medical officer in Australia should possess, are the well known monumental work by James Kerr, "The Fundamentals of School Health," and the volume under review. While Kerr deals with the scientific background and clinical aspects in an unsurpassed fashion, Wood and Rowell present a remarkable variety of tried technical procedures and thus furnish an excellent corollary to the English work on the subject.

CYTOLOGY.

UNDER the inspiring editorship of Dr. E. V. Cowdry there appeared a little while ago a volume on general cytology and more recently two volumes on special cytology.[2]

These volumes mark an epoch in anatomical science, for the editor and most of the contributors have been in the closest touch directly or indirectly in their training and in their teaching with departments of human anatomy. Even some of them may be bluntly described as plain professors of anatomy. A few decades ago anatomy in England was an ardent science full of all that was vital in biological research. After its separation from physiology a period of aridity followed when research save for a few brilliant exceptions, withered and teaching became a dull routine of topographical anatomy. Physiology developed during this droughty period of anatomy into an amazingly active subject, but despite its brilliance it has inadequately represented many problems of great biological interest.

It has become the peculiar glory of American medical science to bring anatomy back into the main stream of biological research and to start a race of anatomists in closest touch with the great biological problems. American anatomists show their community with all other anatomists by using the methods of comparative anatomy and embryology. They show their unity with all other biological workers by seizing on the problems arising out of growth and differentiation. Their distinctive contribution is made in virtue of a morphological approach to a dynamic and functional problem.

The two volumes just issued are a natural sequel to the volume on general cytology. The method used in their production is that employed in the case of the earlier volume. The volumes consist of a series of articles on the tissues and organs, each dealt with by an investigator who has made important contributions to the subject he writes on. As a result each article written with deep knowledge and an insight into the value of the contributions of other workers is of great interest. Carefully chosen illustrations and fairly extensive and well-balanced bibliographies add to the value of each article.

These volumes in no way replace the elementary and larger textbooks which must still serve as an introduction to the subject of histology, but for the advanced student and for anyone who would quickly inform himself as to the present state of knowledge of a particular subject, these volumes will prove invaluable.

It is not possible to discuss individually the thirty-seven articles that make up these two volumes. Almost of necessity the articles vary with the outlook of each author. Some are more purely morphological and in some the embryological side is emphasized. Others again set out in some detail the results of investigation by means of comparative anatomy, while in others again the functional and medical implications of their morphological conclusions are discussed more freely. The incidence of these various ways of treating the subject matter has a more or less appropriate effect according to the problem. In no article, however, is any method used for the purpose merely of piling up descriptive information. The approach is subordinate to the main purpose of the whole, namely the assessment of the present state of our knowledge on the matters treated and the position of that knowledge in relation to biology as a whole.

All biological workers and in particular anatomists, must welcome these volumes and feel grateful to the editor and his collaborators for the results of so much industry and labour. The volumes are excellently printed and bound and the illustrations are all well done.

[1] "Health Supervision and Medical Inspection of Schools," by Thomas D. Wood, A.M., M.D., and Hugh Grant Rowell, A.B., M.D.; 1927. Philadelphia: W. B. Saunders Company, Melbourne: James Little. Royal 8vo., pp. 637. Price: 37s. 6d. net.

[2] "Special Cytology," Edited by Edmund V. Cowdry, Volumes I and II, containing articles by thirty-seven authors; 1928. New York: Paul B. Hoeber, Incorporated; 1,348 pages, with 693 illustrations. Price: 87s. 6d.

Analytical Department.

"YEUCLIN."

IN our issue of January 14, 1928, we published a report on the preparation of "Yeuclin" and analyses of this preparation. In this report it was stated that, while freshly prepared "Yeuclin" was found to ferment sugar in a vigorous manner, this activity had almost entirely disappeared after the preparation had been kept for five weeks.

The manufacturers, Rocke, Tomsitt and Company, Proprietary, Limited, have since modified the process of preparation by leaving out the essence of cloves previously included. This was done with the object of preventing the loss of activity. In addition it should be pointed out that the firm has removed its factory to new premises in South Melbourne and has set aside one section of the building for the preparation of "Yeuclin." Our inspector visited the new factory for the purpose of investigating the new conditions of manufacture. Everything was found to be in excellent order. The new conditions are much superior to those that obtained at the old premises.

The samples collected have been examined. They contain at least 90% of yeast, as advertised. Active fermentation of sugar is effected. When the sample of "Yeuclin" was examined after an interval of nine weeks, it was found that the fermentative activity was not diminished. It thus appears that the loss of power on keeping previously noted, has been remedied. As far as the conclusion attached to our report is concerned, it must be amended for the new preparation by the deletion of the proviso that only fresh tablet should be used.

The Medical Journal of Australia

SATURDAY, OCTOBER 6, 1928.

National Insurance.

It has been anticipated for many years that what is known as national health insurance would be introduced in the Commonwealth. Both political parties appear to have adopted the idea and have pledged themselves to introduce a measure dealing with this matter. The appointment of a Royal Commission to investigate the subject and to recommend to the Federal Government a scheme best suited to Australian conditions was appointed in 1923 and issued its report in 1925. This Royal Commission worked under the chairmanship of the Honourable J. D. Millen. While the Commission was taking evidence the views of several Branches of the British Medical Association were sought and conversations took place with the object of securing the willing cooperation of the members of the medical profession. At that time it became clear that it was not proposed to include in the scheme any form of medical benefit. It has been pointed out in these columns on many occasions that compulsory insurance of workers against the financial burden of illness has been regarded as an efficient remedy for pauperism, but that there is no justification to use such an expedient merely to relieve the worker from the responsibility of making reasonable provision for loss arising out of illness or accident. Under existing circumstances the provident worker contributes to a friendly society and thus insures himself against the unknown financial loss brought about by having to meet the expenses of medical attendance and by having to pay for his own board and lodging and other expenses of life and those of the people dependent on him. His employer does not assist him directly in paying the premiums to the friendly society, nor does a beneficent government contribute anything. It is true that in theory at all events his wage could be adjusted under an insurance scheme, so that the employer would not be saddled with an additional charge because the workman is not required to make full provision by himself. In practice, however, the employer's contribution would have to be added to the cost of production and ultimately be defrayed by a raising of the price of the commodity manufactured or sold. In this way the community really pays in the long run both the employers' contribution and that of the Government. Again, under existing circumstances when the incapacity from illness or accident overtakes a man who is not provident or whose wages are insufficient to enable him to meet his liabilities to a friendly society, it is the medical profession who bears the burden of the medical attendance and the charitable public who supports the patient while he is in a public hospital or charitable institution. In recent years the Government is replacing the charitably disposed in providing funds for the upkeep of hospitals. Before the medical profession agrees to extend contract practice to cover the whole of the wage-earning part of the community, it will need to be convinced that national health insurance is a social necessity and not merely a political movement. Moreover, the medical profession, having knowledge of the experience in England and having a long experience of its own with the friendly societies in the Commonwealth, will certainly refuse to entertain any proposals that are unfavourable both as regards remuneration and as regards control.

The *National Insurance Bill* was introduced into the House of Representatives on September 14, 1928, by the Honourable Earle C. G. Page, Treasurer, who explained the measure on the motion for the second reading. As indicated above, medical benefit is not included in the provisions. He took pains to explain that this was an insurance bill, not a measure for the prevention of the causes of financial distress due to illness, accident or old age. It is difficult to follow his argument, for insurance connotes the safeguarding against loss and the loss arising from illness takes the form of a liability to pay for medical attendance as well as for maintenance, for the doctor as well as for the butcher. It will be gathered from the bill when the text is published that the compensation of twenty-seven shillings and sixpence a week is wholly inadequate to keep a home going while the bread-earner is no

longer receiving his wages and to pay for medical attendance. It has been argued that the worker will be forced to join a friendly society or other organization that provides medical attendance at contract rates. Experience throughout the world gives this a direct contradiction. The improvident will trust to chance. While we hold the opinion that the proposals now before Parliament are fundamentally unsound, because of the non-inclusion of medical benefit and because it has yet to be proven that there exists a real necessity for the scheme in Australia, we must lay emphasis on the fact that the medical profession is utterly opposed on principle to national health insurance.

There are two clauses which affect the medical profession in this measure. The first has to do with the certification of the causes of incapacity. The Honourable Earle Page has promised a great deal. He has said that there will be a panel of medical men and that every reputable medical practitioner will be available. The medical practitioners will deal with the Insurance Board and not with the approved societies. They will be paid by the Board. Every insured person will have the right to choose his own medical examiner, unless there is a sound reason why the chosen medical practitioner ought to be disqualified or penalized. Steps will be adopted to prevent the giving of false certificates and of unnecessary certificates. Those who are parties to such wrong actions, will be suitably punished. It is stated that a fine of £50 or imprisonment for a term not to exceed three months may be inflicted on anyone who makes a false statement in a certificate of incapacity.

The second point concerns the acceptance of the friendly societies as approved societies. According to the provisions of the bill the administration of the benefits will be in the hands of the approved societies, of which there will be two classes. There will be the ordinary approved societies, including any body of persons forming a society which complies with the provisions of the act, a department of a company or other body formed for the purpose of the act or a friendly society, life assurance society or trade union. It is specifically laid down that the funds of the friendly society or life assurance society or trade union must be kept distinct from the funds provided by the National Insurance Board and that any profits arising out of the national insurance business must be separated from the profits derived from the friendly society business and used in strict accordance with the conditions laid down in the measure. It remains for the medical profession to decide whether it is prepared to cooperate with the Government in connexion with the insurance scheme if the approved society provision is retained or rather if the friendly societies are recognized as approved societies. The second class comprises the general approved society, which will be an organization brought into existence *ad hoc* and controlled by the National Insurance Board. It will receive the flotsam and jetsam from the other approved societies, the ineligibles, the expelled members and the casual persons who neglect to join an approved society.

The second reading debate has been adjourned. Within a shorter or longer time the bill will, no doubt, be read and will then be considered in committee. In the meantime the medical profession must make up its mind concerning its future action. If it can rely on the provision that the medical practitioner giving certificates will deal with the National Insurance Board and not with any assured society, there is no need for hesitation. The exclusion of medical benefit is significant. Perhaps this will be introduced at a later date. An amendment of the constitution, it is held, would have to precede such an amendment. Should the administration of medical benefit be placed in the hands of the approved societies at a future date, the medical profession could still refuse to give medical attendance under the measure.

Current Comment.

THE VAN DEN BERGH REACTION.

Since the introduction of the Van den Bergh test much discussion has taken place in regard to the nature of the reaction and the constitution of the bile pigments. It will be remembered that the reaction depends on the colour reaction given by bilirubin with the diazo reagent of Ehrlich. Two types of reaction occur, the direct and the indirect. Of these the former is the more important and several types are recognized. The prompt or immediate direct reaction results on the addition of the diazo reagent directly to the serum; the delayed

direct reaction occurs some considerable time after the reagent has been added. There also occurs what is known as the biphasic reaction. The occurrence of this type of reaction is taken as indicating the presence of two types of bilirubin in the serum, one giving the prompt and the other the delayed direct reaction. When alcohol is added to the serum of a patient with jaundice an immediate colour reaction occurs when the diazo reagent is added and this is the essential feature of the indirect reaction. Readers are referred to an article by Maud and S. O. Cowen, published in this journal on February 21, 1925, for a description of the test and for a discussion on its significance and clinical value.

McNee in 1922 advanced the view that the type of reaction depends on whether the bilirubin has passed through the hepatic polygonal cells or not. If it has done so, a direct reaction always occurs, the indirect reaction in the presence of hæmolytic jaundice is explained as an increase in circulatory bilirubin that has not been through the hepatic cells. Van den Bergh suggested that the bilirubin in the serum of a patient with obstructive jaundice is in a free state and that in a serum giving the indirect reaction it is combined with a protein; the addition of alcohol breaks up the compound and the colour change is brought about. Some important investigations were reported last year by Davies and Dodds. They found that the behaviour of bilirubin towards the diazo reagent is constant and that changes are due either to alteration in the hydrogen ion concentration of the solution or to an oxidative change occurring in the pigment. In their opinion the direct reaction is due to bilirubin and clinical and experimental evidence supports the view that bilirubin can be oxidized to biliverdin in the circulation, this pigment being the only one which gives the indirect reaction. In 1926 Collinson and Fowweather produced experimental evidence in favour of their view that while the bilirubin giving the prompt direct Van den Bergh reaction is an alkaline salt (in their opinion probably the ammonium salt) the form responsible for the indirect reaction is the free acid. They held that this view was in keeping with the modern theory of the causation of jaundice.

W. Morrell Roberts has made some observations on the Van den Bergh reactions and holds that neither the views of Davies and Dodds nor those of Collinson and Fowweather offer a satisfactory explanation of the facts.[1] He finds that specimens of hæmolytic serum give a direct reaction if extracted by chloroform and dissolved in an alkaline buffered solution and he points out that this is in opposition to the hypothesis of Davies and Dodds that the pigment in a hæmolytic serum is an oxidation product of bilirubin. Roberts's view is undoubtedly opposed to such an hypothesis, but the suggestion made by Davies and Dodds was more indefinite than an hypothesis. Their statement is that certain facts "suggested that . . . the delayed and indirect reactions might possibly be due to these oxidation products." Roberts also does not refer to the views of Davies and Dodds on the hydrogen ion concentration of the solution. He states that blood serum is so complex a physico-chemical system and the actual mechanisms of bile pigment formation and jaundice are so incompletely understood, that it is not remarkable that serum is encountered from time to time, giving results which will not fit in with any theory yet advanced to explain the Van den Bergh reaction. He believes that, taken generally, the findings are compatible with the assumption that the bilirubin of serum giving the indirect reaction exists in the free colloidal condition, since it does not pass through an animal membrane and is capable of being extracted from the serum by chloroform, while a normal serum to which colloidal bilirubin has been added, behaves in a precisely similar manner. Roberts also carried out a series of investigations which in his opinion render the views of Collinson and Fowweather untenable. He holds that the bilirubin is in combination with some substance whose nature is as yet undetermined; this combination is destroyed by the addition of alcohol and the bilirubin is left as a salt, probably the sodium salt.

In this brief description of the various investigations only the bare outlines have been given. To do more would necessitate almost the entire reproduction of the papers, for the authors have shorn their accounts of all unnecessary detail. The inevitable conclusion reached by the reader is that the chemical nature of the bilirubin itself is not properly understood and that it may exist in more than one combination. This conclusion has been reached by C. E. Newman who has also investigated the subject.[1] He has confirmed the observations of Davies and Dodds on the influence of variations in hydrogen ion concentration on the results of the test. He has found that the colour of any completed Van den Bergh test solution can be made slightly blue by the addition of a trace of acid, in other words, that azobilirubin behaves to acids and alkalis as an indicator. He has been able to analyse serum giving the biphasic reaction into pigments giving the prompt and delayed reactions and has produced the serum by synthesis from these pigments. Newman believes that all the facts point to pure bilirubin being an organic acid containing two COOH groups and capable of forming two series of salts. The four distinct forms of bilirubin described by him are free acid bilirubin, delayed reaction bilirubin, sodium hydrogen bilirubinate and di-sodium bilirubinate. The last named occurs only in extreme alkalinity and does not concern physiological or pathological states in the body; the last but one is in Newman's opinion the salt producing the prompt reaction. He promises to deal in a future paper with the type of bilirubin producing the delayed reaction.

Even when the types of bilirubin salts have been determined it will probably be necessary to set up some standards of hydrogen ion concentration levels for the performance of the test in order that irregular reactions may be capable of explanation.

[1] *The British Journal of Experimental Pathology*, June, 1928.

[1] *The British Journal of Experimental Pathology*, June, 1928.

Abstracts from Current Medical Literature.

PHYSIOLOGY.

Effect of Exercise on Diastolic Heart Size.

FOR a considerable time the question of the influence of exercise upon the size of the heart has been a debated one. F. D. McCrea, J. A. E. Eyster and W. J. Meek (*American Journal of Physiology*, January, 1928) have studied the effect of exercise of varying degrees carried out on a bicycle ergometer on the diastolic size of the heart as shown by teleröntgenograms. Such change as the heart undergoes during moderate exercise, is slight. It may remain unchanged or increase or decrease slightly. During a short period of severe exercise there is a general tendency for the cardiac area to increase, although exceptions were noted. After moderate exercise or a short period of severe exercise the tendency is for the cardiac area and transverse diameter to decrease. The diminution is more pronounced after severe exercise. After a long period of severe exercise the heart may not return to its original volume until five minutes after the exercise is over. The minute volume increases considerably during all types of exercise used. After exercise is over, the minute volume usually shows a very pronounced and rather abrupt diminution, reaching its greatest diminution in about five minutes after cessation of exercise. The very low figures for the minute volume, sometimes observed after exercise, indicate probably an increased stroke volume during exercise which persists for more than five minutes after the cessation of the exercise.

Adrenalin Secretion on Exposure to Cold.

HIBERNATION and the effects of cold on the organism have been made the subject of age-long scientific inquiry. Many investigators have given special attention to the influence on carbohydrate metabolism of low external temperature. S. W. Britton (*American Journal of Physiology*, February, 1928) has carried out experiments on cats rendered hypoglycæmic by injections of "Insulin" and then exposed to cold. In some of the experiments the adrenals were intact, in others the adrenals had been removed. Cats with adrenal glands intact which have been rendered hypoglycæmic to the convulsive level by "Insulin," lose heat rapidly on exposure to cold. While the body temperature is falling, the skeletal muscles manifest marked hypotonus and shivering appears. Coincidentally the blood sugar rises to a normal or a hyperglycæmic level and convulsions are abolished. The animal recovers rapidly when removed from its cold surroundings. Animals without active adrenals which have been similarly treated with "Insulin" and exposed to cold, also undergo a rapid diminution of body temperature; in contrast to the responses of animals with active adrenals there occurs no reestablishment of the normal blood sugar and shivering does not supervene. Muscle hypertonus may be present, but no significant ability to recover from low body temperatures is observed. The author presents reasons for the belief that a natural autumnal diminution in sympathico-adrenal activity may result in relatively unstable hibernating organisms in the commencement of winter sleep. The phenomena which are associated with the recovery of animals from hibernation, and also of artificially cooled homo-iothermic animals from low body temperatures, definitely point to increased activity of the sympathico-adrenal mechanism as the immediate agency in the restoration.

Effect of Yeast upon Metabolism.

E. U. STILL AND E. M. KOCH (*American Journal of Physiology*, May, 1928) have studied the effect of the administration of dried yeast on the general metabolism. A fixed diet was given for three days without yeast, then two intervals of four days with three cakes of yeast *per diem* were followed by two intervals of four days without yeast. The addition of yeast to a low protein, low purine diet after the subjects had arrived at low uric acid elimination, caused no increase in uric acid excretion. If, on the other hand, the yeast was added while the uric acid elimination was still high or while subjects were on a high protein, meat diet, an increased elimination of uric acid followed promptly. There was no increase in blood uric acid even after several weeks of yeast ingestion. The total urinary phenol concentration was less during and following yeast ingestion in five out of six individuals. There was during yeast ingestion an increase in total (urinary and fæcal) nitrogen and phosphorus. The larger share of this excess excretion was found in the fæces. Whilst yeast generally produced greater regularity and ease of evacuation, the moisture content of the fæces did not seem to be either noticeably or consistently increased.

Gastric Acidity During Digestion.

IN recent years a very important part has been attributed to the regurgitation of alkaline intestinal contents into the stomach during digestion. While agreeing that some regurgitation does occasionally take place, H. MacLean and W. J. Griffiths (*Journal of Physiology*, March, 1928) show that regurgitation plays but a small part in the physiology of digestion. If fluid containing bicarbonate should enter the stomach when it contains hydrochloric acid, clearly carbon dioxide would be liberated, consequently a larger amount would be dissolved in the fluid. Samples removed from the stomach at fifteen minutes intervals after a test meal were examined for carbon dioxide content, as well as for free hydrochloric acid and neutral chloride. There was no significant increase in the amount of carbon dioxide dissolved at any stage of the digestion, although the concentration of free acid fell and the concentration of neutral chloride rose in normal fashion. There was also no appearance of significant quantities of trypsin in the stomach contents. Acid as sulphuric acid was introduced into the stomach and the acidity of the contents was found to fall regularly owing to the secretion of a neutral fluid containing neutral chloride. Since sodium chloride is found in the stomach in the absence of duodenal regurgitation, it must be secreted by the gastric glands. Evidence is given that chloride is secreted at a definite fixed concentration, part of it unchanged as sodium chloride and part changed into hydrochloric acid and that the extent of this change governs the acidity of the secreted juice. The chloride ion is secreted in about the concentration in which it is present in the blood.

Secretion from Isolated Gastric Pouch.

H. MACLEAN, W. J. GRIFFITHS AND B. W. WILLIAMS (*Journal of Physiology*, March, 1928) have studied the secretion of gastric juice in the dog by making a Pavlov pouch from the stomach and removing the contents at definite intervals and analysing for free hydrochloric acid and neutral chloride. A meal of minced meat was given into the body of the stomach. Immediately after feeding, the acidity of the juice secreted by the Pavlov pouch was found to rise rapidly to a high level to be followed by a sharp fall, sometimes at once, sometimes after a varying interval of time. When the stimulus of the first meal had completely passed off, a second meal was given. There was immediate response with little or no change in the total chloride concentration. The concentration of chloride in the juice being fixed, a rise in free hydrochloric acid was accompanied by a corresponding fall in neutral chloride, so that the curve for neutral chloride is practically a mirror image of the curve for free hydrochloric acid. Since the acid concentration in an isolated pouch into which no regurgitation of alkaline duodenal fluid can possibly take place, shows during digestion a reduction of acid and a corresponding increase of sodium chloride, it follows that regurgitation is not necessary to bring about the reduced acidity found in the normal stomach during the later stages of digestion.

The Law of the Intestine.

IT is almost universally taught today that food goes down the bowel because according to the "law of the intestine" there is always contraction above and relaxation below a stimulated point. There is a good deal of evidence that this is not universally true. W. C. Alvarez and A. Zimmermann (*American Journal of Physiology*, December, 1927) have studied the question by means of

motion pictures of the intestines of animals opened in a bath of warm Locke's solution. That Bayliss and Starling themselves realized that the field of application of the law might be limited, is shown by the fact that they qualified their statement with the words "if cerebral reflexes be excluded, excitation at any point" and so forth. If any importance is to be attached to the law, its workings should be demonstrable in the case of the peristaltic rushes that normally carry intestinal contents down the bowel. Films were made and successive pictures thrown on a screen, the width of the bowel at three or more points was measured with a pair of dividers and the distances plotted on a curve. An advantage of this method is that the bowel is not in any way interfered with during the examination. The widening of the lumen ahead of a contraction wave was always due to distension by either liquid or solid contents. Balls of fæces pass down the colon of the rabbit in spite of the fact that there is a powerful contraction below as well as above the distended region.

BIOLOGICAL CHEMISTRY.

Chlorides in Meningitis.

G. C. Linder and E. A. Carmichael (*Biochemical Journal*, Volume XXII, Number 1, 1928) have shown that the fall of chlorides in the cerebro-spinal fluid in meningitis is due to other causes than increased permeability of the meninges. Four patients were studied; two had tuberculous meningitis, one meningococcal and one streptococcal meningitis, all proven bacteriologically. Cerebro-spinal fluid and arterial blood from which the serum was separated as soon as possible, were withdrawn at the same time into paraffin syringes without contact with the air. The chloride content, the carbon dioxide combining power, the total fixed base, the inorganic phosphate content and the hydrogen ion concentration were determined in each specimen and the results are tabulated, together with the mean of a series of twenty-six probably normal cerebro-spinal fluid and serum analyses published by Hamilton. In all the specimens of cerebro-spinal fluid a decrease in chloride concentration occurred with a corresponding decrease in serum chloride. The ratio of the chloride content of the serum to the chloride content of the cerebro-spinal fluid was remarkably constant and agreed well with that calculated from Hamilton's series. The constancy of this ratio excludes the possibility that a change in permeability was the cause of the fall of the cerebro-spinal fluid chloride content and is a fact supporting the view that the Donnan law has an important rôle in determining the composition of the fluid. The serum and cerebro-spinal fluid remain almost neutral in reaction and so the decrease in chloride content must be accompanied by an increase in the other anions or by a decrease in the cations. There was found to be present an increase, sometimes large, in the bicarbonates in both fluids and a small decrease in the total base in the cerebro-spinal fluid. At times a greater depletion of base occurs in the cerebro-spinal fluid and in serum; in such cases the bicarbonate content does not rise and may be low. There was less undetermined acid in the cerebro-spinal fluid than in the serum and no significant change took place. There was no indication in this work of the increase of lactic acid in meningitis reported by Glaser.

The Hydrogen Ion Concentration of Fæces of Rhachitic Children.

T. Redman (*Biochemical Journal*, Volume XXII, Number 1, 1928) has endeavoured without success to obtain a definite correlation between different stages of the disease of rickets and the hydrogen ion concentration of the fæces. The electrometric method with the quinhydrone electrode was used. The fæces of twelve unselected patients, treated as out-patients with artificial sunlight, were examined. All were acid. Twelve patients treated in hospital were next examined and X ray examination revealed healing in five instances and improvement only in the others. In the first series only two samples of fæces were alkaline—both from cured patients. Subsequent examination yielded alkaline values in all samples except three; one of these was from a cured patient and two were from patients not cured. Samples from seven untreated patients and two normal children were then examined; only two samples were alkaline and both came from patients with rickets. Fourteen persons with severe untreated rickets and one normal person were then taken and put on the same anti-rhachitic diet, but with different treatment. The fæces were collected every day as far as possible. Curves are given showing that the reaction varies from acid to alkaline and back again regardless of the condition of the patients; the same variations occurred in the fæces of a normal person used as a control.

Kidney Phosphatase in Disease.

R. T. Brain and H. D. Kay (*Biochemical Journal*, Volume XXI, Number 5, 1927) have studied the phosphatase content of human kidneys obtained *post mortem* from the bodies of persons dead of various diseases including kidney disease and that of kidneys from rabbits with acute experimental nephritis. Their results show that in patients with chronic nephritis who died of uræmia, the phosphatase content of the kidney is reduced on the average to about one-sixth of the normal adult value. The phosphatase content was also reduced when death was not due to nephritis but when degenerative changes were found in the kidneys *post mortem*. When a severe infective process was present before death, there was a slight decrease in the phosphatase content. They also found that fœtal and very young kidney tissue was much less active than older tissue. In rabbits an acute experimental nephritis was induced and the results of the phosphatase activity of the kidney of these and normal animals are tabulated. The kidneys were examined histologically and the degree of damage found agrees with the order of decreasing phosphatase content per gramme of tissue. These results, though not by any means conclusive, suggest that the enzyme phosphatase plays an intimate part in renal activity, either cellular or secretory, and that its presence in amounts greater than a certain minimum is essential for the proper functioning of the organ.

Early Obstructive Jaundice.

A study of the pathogenesis of early obstructive jaundice has been made by E. S. Guzman and John H. Bumstead (*The Journal of Experimental Medicine*, June 1, 1928). The Van den Bergh test was used for the detection of bilirubin in the blood and lymph. Five experiments were performed on dogs known not to have physiological bilirubinuria. All gave concordant results. The animals were given ether, double nephrectomy was performed and the *ductus choledochus* and cystic duct were ligated. Samples of blood were taken every fifteen minutes from the carotid artery by means of a cannula and when the direct Van den Bergh reaction appeared, the dogs were killed with ether and at necropsy the ligatures were verified and portions of the liver taken for microscopical examination. Two distinct processes were manifest: First, the accumulation of the normally circulating bilirubin in the blood with its indirect reaction for several hours and, secondly, the subsequent appearance of the bile bilirubin giving the direct Van den Bergh reaction. The authors suggest that the first process may be due to a temporary reflex inhibition of the function of the liver cells and compare it to the same phenomenon which usually occurs in the kidney when the ureter is ligated. The second process begins before any rupture of the bile capillaries is visible. Liver sections made six to seven hours after obstruction show that these bile capillaries are dilated and extend between the liver cells in small distended pouches, the blind end of these lying in contact with the pericapillary spaces. It is possible that bile may diffuse from these thin-walled pouches into the perivascular lymph spaces, this diffusion being favoured by the mounting pressure inside the bile ducts. The experiments show that in early obstructive jaundice bile first appears in the lymph, but exclusion of the thoracic duct from the circulation by drainage causes a delay of only a few hours in the appearance of bile bilirubin in the blood stream and the authors conclude that after biliary obstruction bile enters the circulation both by way of the blood capillaries and the lymphatics, although the latter route is the more important.

British Medical Association News.

SCIENTIFIC.

A meeting of the Queensland Branch of the British Medical Association was held in the Geology Lecture Theatre at the University of Queensland on August 3, 1928, Dr. Eustace Russell, the President, in the chair. The members of the Royal Society of Queensland and the professorial staff of the University were present by invitation.

The Joseph Bancroft Memorial Lecture.

Dr. Eustace Russell, the President, in introducing Professor W. Colin MacKenzie, gave a brief outline of the studies of the late Joseph Bancroft. He said that the occasion was a memorable one, as it inaugurated the conferring of the Bancroft medal.

Professor W. Colin MacKenzie then delivered the Joseph Bancroft Memorial Lecture. He chose as his subject "Functional Anatomy and Medical Practice" (see page 422).

This address was illustrated by numerous diagrams, specimens and a series of still and moving pictures. Concluding the series of moving pictures which dealt mainly with the living history of the erect posture, three patients, one boy and two men, were shown on the film screen. They illustrated the instability of the erect posture and the fight waged by primitive man for its accomplishment. In this all had failed and were thrown back to stages seen in primitive man and the anthropoid.

The boy, a sufferer from spastic paraplegia, was acquiring functions in locomotion which he did not previously possess. The two adults, victims of the after effects of encephalitis, were losing erect posture functions which they previously possessed. The boy, aged seven, was a typical sufferer from spastic paralysis and had been under treatment for two and a half years. Before that he had been unable to walk or stand and had commenced walking alone only six months previously. He had been treated by complete rest in splints to overcome bilateral adduction, contracted knees and foot drop, he had been gradually reeducated in the use of muscle groups, had been taught balance and lastly ambulation. No operation, even tendon lengthening, had been performed. Thymus gland had been administered throughout treatment. He walked without splints, crutches or sticks. Since he had commenced walking, his general mental outlook had improved. The two adults demonstrated instability in walking erect. With the concentrated effort of the mind a moderate degree of erect posture was maintained, but when the mind was distracted, as in lighting a cigarette, the erect posture system failed and the patient sagged. There was ease in climbing or running up stairs, as illustrated by a ladder (anthropoid feature). When the patient was supported by an assistant (as a splint) ambulation was easy. Both patients progressed, like the anthropoid, well on four limbs. As a result of this disease the erect posture mechanism had failed and treatment must be directed towards its return.

Dr. E. Sandford Jackson proposed a vote of thanks to Professor MacKenzie. He had acted as house surgeon to the late Joseph Bancroft and of all those present at the meeting he and Dr. J. Lockhart Gibson were the only ones who had known Joseph Bancroft intimately. Bancroft had always been willing to teach others all that he knew, and his knowledge and interest had extended beyond medicine to the realms of animals and plants. His motto had always been to doubt all that he was told until he had proved it for himself.

Professor E. J. Goddard said that he considered it a great honour to be called upon to second the vote of thanks. The oration emphasized the necessity for increased studies in certain subjects in medical education. Evolution was accepted by the ordinary man, but the lesson of Professor MacKenzie's oration was that reversion of structure could be understood only if evolution were understood. There were two things which impressed him. In the first place there was the insufficiency in medical education of adequate embryological training which he regarded as most essential. The student of science experienced more difficulty in comparative anatomy than the man who had not done his science course, as the latter did not realize the difficulties involved. In the second place there was the problem of correlation in diagnosis. He would like more attention to be paid to comparative anatomy in the medical course and he would also like to see all intending medical students complete a preparatory course in science before proceeding to medicine. He congratulated the Queensland Branch of the British Medical Association on its choice of a lecturer.

The vote of thanks was carried by acclamation.

In his reply Professor MacKenzie said that the Institute of Anatomy at Canberra would be completed next year and that there would then be material for all to work at comparative anatomy.

Dr. Eustace Russell presented Professor MacKenzie with the Bancroft medal.

Medical Societies.

MELBOURNE PÆDIATRIC SOCIETY.

A meeting of the Melbourne Pædiatric Society was held at the Children's Hospital, Carlton, on May 9, 1928, Dr. H. Douglas Stephens, the President, in the chair.

Congenital Dislocation of the Hip.

Dr. H. Douglas Stephens presented two patients with double congenital dislocation of the hip joint. The children were six and thirteen years of age respectively. In neither had the condition been treated. Dr. Stephens stated that it was usual to operate when one joint was involved up to the age of eight years and when both joints were affected up to the age of six years. The traumatic arthritis which resulted from operation on older patients, was often very troublesome.

Dr. R. M. Downes, C.M.G., agreed that it was wiser to leave the older patients alone. He had been forced to operate on one patient; he had attempted to form an artificial acetabulum on each side. It was too soon to determine what the final result would be.

Dr. H. C. Colville said that he was optimistic in regard to the prognosis of the younger child. He thought that she could be successfully treated by conservative methods. He had put the hips of a patient with a similar condition in plaster in the frog position, after he had made an attempt to reduce the dislocations. After some weeks he had found that the femoral heads could be brought back into the acetabula with ultimate good result.

In reply Dr. Stephens said that the results he had obtained of the treatment of congenital dislocation of the hip joints had not been as satisfactory as he would have wished. He preferred to place the child on a circular extension frame and not in plaster, as there was some danger of separating the epiphyses or of fracturing the neck of the femur in manipulating the joints after they had been fixed in the plaster for some time.

Fragilitas Ossium.

Dr. R. M. Downes, C.M.G., demonstrated the condition of an infant, aged three weeks, who was suffering from *fragilitas ossium* with multiple fractures. It had seemed a normal infant at birth and had weighed 1·36 kilograms (three pounds). Ten days later the radius and the ulna of the left forearm had been fractured and it had been noticed that there was a lack of ossification of the cranial bones. The sutures had been widely separated. Later the left humerus had been fractured and that had been followed by fractures of the clavicle and of ribs. The infant appeared to be healthy, but the sclerotics of the eyes were of an abnormally blue colour. During the nine days preceding the meeting, there had been some increase in the ossification of the cranial bones. The infant's father was a hemiplegic. There were two other children, both of whom were said to be healthy. Nothing abnormal

had been ascertained in regard to the family history. Since the patient had been admitted to hospital several of the fractured bones had united. There was radiographic evidence of active ossification at the points of union. Dr. Downes stated that the condition was better known as *osteogenesis imperfecta*. One hundred and twenty-five cases had been collected from the literature. In his patient there was the usual absence of pain when the fractures occurred. The skiagraphic appearance of deficient ossification was present. He thought that the prognosis in his patient was poor. The histological changes in one patient had been described by Lovett and Nicholl in 1906. These observers had found that the condition differed from achondroplasia in being an aplasia of the periosteum and a metaplasia of the persistent cartilage cells. Plates of dense bone were seen in the microscopical sections not laid down in normal laminæ; there were no canaliculi nor any Haversian canals. In the skiagraphic films the bone appeared to be thin and translucent, but the epiphyses seemed to be normal.

Dr. H. B. Graham asked Dr. Downes if he had used "Ostelin" in the treatment of this condition. It had been reported in England that "Ostelin" had been used with good results in various types of fractures.

Dr. H. Douglas Stephens said that he had seen a child with many fractures at birth; the mother had stated that the child had had what she described as convulsions while in the uterus on several occasions.

Dr. Jean Macnamara gathered from the literature that if the patient lived beyond the age of sixteen years, the tendency to fracture grew less, but that growth and development were always retarded.

Progressive Cardiac Failure.

Dr. H. B. Graham showed a boy, aged seven years, who was suffering from progressive cardiac failure and enlargement of the spleen. The diagnosis of his condition rested between congenital and infective heart disease or a combination of the two. The child had weighed five kilograms (eleven pounds) at birth. He was said to have had pertussis at the age of three weeks and had been languid and miserable all his life. He had not had rheumatic fever or chorea or any other serious illness, as far as could be ascertained. He had not attended school on account of his ill health. The parents were alive and well. There were seven brothers and sisters, all of whom were alive and well. The mother had had no miscarriages. His health had become worse since December, 1927, and he had become short of breath on exertion. At times he had had attacks of dyspnœa and vomiting without exertion. His feet had swelled at times and he had had pain in his hands, arms and legs and sometimes in his neck. There were no red spots on the skin, but it was irritable in the region of the pain. He was sometimes feverish at night time and he had had sharp attacks of pain in the chest and in the left hypochondrium three months previously. He was losing weight rapidly. On examination it was seen that he was an undersized boy. There were no abnormalities of his eyes, tongue or throat. He had several carious teeth. His fingers and toes were clubbed, but were not tender. The apex beat of his heart was in the fifth intercostal space, 8·5 centimetres (3⅜ inches) from the middle line and nearly 2·5 centimetres (one inch) outside the nipple line. The cardiac dulness extended about half a finger's breadth to the right of the sternum. There was a heaving systolic impulse with a thrill at the apex beat and a diastolic shock at the base of the heart. Auscultation revealed at the apex beat a loud systolic bruit conducted outwards and a diastolic bruit heard loudest at the apex beat. The second sound was clear at the aortic area and much intensified at the pulmonary area. On admission he had had a few extra systoles, about one every twenty beats, and there had not been a full compensatory pause. Examinations of the lungs had disclosed that the resonance was impaired at both bases with numerous crepitations and rhonchi over the same areas. The lower border of the liver was palpable one finger's breadth below the costal margin and was not tender. The spleen was enlarged downwards for the extent of nearly two fingers' breadth below the costal margin. It moved downwards with inspiration. It was not tender on pressure. No free fluid was detected. No abnormal signs were elicited in the central nervous system. The systolic blood pressure was seventy millimetres of mercury. On auscultation the sound corresponding to the diastolic pressure changed at forty millimetres, but was distinctly audible at zero. There were no visible changes in the *fundi oculi*. The urine was clear and contained no red blood corpuscles. A blood examination had been carried out. There were 3,850,000 red blood cells per cubic millimetre, 10,200 leucocytes and between 60% and 70% hæmoglobin. The polymorphonuclear cells represented 70·5% of the leucocytes, the large lymphocytes 5%, the small lymphocytes 23% and the eosinophile polymorphonuclear cells 1·15%. No reaction had been obtained to Fouchet's test. *Staphylococcus albus* had grown in the blood culture tubes, probably a contamination. No deviation of complement had been detected on carrying out the Wassermann test. An electrocardiographic examination had not disclosed any abnormality. The moderate exertion of sitting up and lying down in bed fifteen times had caused his pulse rate to rise from 110 to 120 beats per minute. The rate returned to 110 in four minutes. Walking about the ward for half an hour had caused the pulse rate to rise from 100 to 125. The rate had returned to 100 in twenty minutes. He had become slightly short of breath and had wished to lie down.

In commenting on the condition Dr. Graham mentioned the possibility of a congenital heart condition and the probability of a cardiac infection. The absence of urinary and other signs seemed to exclude subacute bacterial endocarditis of the classical type, but not rheumatic endocarditis. He admitted that the splenic enlargement could not be explained in this way. He suggested that the joint pains might have been caused by multiple infective emboli. The boy had been mildly febrile since admission to hospital. His temperature had reached 37·5° C. (100° F.).

Dr. Lionel Hood thought that the condition was consistent with a rheumatic infection with possibly a superimposed bacterial endocarditis.

Dr. J. W. Grieve reviewed the salient points in the differential diagnosis and said that he was inclined to the opinion that the pain in the left hypochondrium pointed to an infection. In a series of cases recently reported both splenomegaly and clubbing of the fingers had been found; in a few of the patients there was a pure rheumatic infection.

Œsophageal Stricture.

Dr. E. W. Gutteridge spoke of a boy, aged two years and eight months, who had an œsophageal stricture. The child was under treatment by gastrostomy and repeated retrograde dilatation.

Laryngeal Stenosis.

Dr. Gutteridge's second patient was a boy, aged five years, with a laryngeal stricture. He was treating the condition by laryngostomy and the use of Jackson's tube. The result appeared to be satisfactory.

Pathological Specimens.

Dr. Reginald Webster demonstrated a series of pathological specimens.

Suboccipital Dermoid Cyst.

The first was a suboccipital dermoid cyst from a girl, aged seven years. It had been removed after death. The patient had suffered from vomiting in the morning for nine months. She had had headache for three months and a staggering gait with a tendency to fall forward and to the left side for some weeks prior to admission. Her eyesight had become dim and the patient had been languid and had wanted to lie down for some weeks. She had been treated at the Victorian Eye and Ear Hospital at intervals for three months and her vision had been decreasing progressively. On November 7, 1927, her vision had been $^{6}/_{24}$ in each eye. The right plantar reflex had been extensor. Her abdominal reflexes had been equal and active and her peripheral sensation had been normal. There was definite optic neuritis. No reaction had been obtained to the von Pirquet test either with human or bovine tuberculin. No reaction had been obtained to the Casoni test for hydatid sensitiveness and there had been no deviation of complement when

the Wassermann test was applied. The girl had been seen by Dr. R. R. Stawell on November 10, 1927, who had diagnosed a subtentorial tumour, probably cerebellar. In commenting on the case Dr. Webster stated that the specimen was a unique one of a dermoid cyst at the base of the brain, pressing upwards on the cerebellum and downwards on the fourth ventricle.

Dr. H. C. Colville said that clinically children with tumours of the kind demonstrated did not often have very definite localizing signs. He asked whether it was justifiable to operate on the posterior fossa without more definite indications than those of intracranial tumour.

Dr. H. D. Stephens said that tuberculoma was the commonest brain tumour on the other side of the world. He had operated on many children with subtentorial tumours and had found removal almost impossible. He suggested the implantation of radium emanation carriers into the substance of the tumours.

Dr. J. W. Grieve said that the patient had manifested typical signs of a subtentorial tumour with chief incidence on the left side. *Post mortem* the mass of the tumour had been found to be more on the left than on the right side.

Dr. C. H. Osborn commented on the rarity of dermoids in the brain. In an article published by Harvey Cushing only two subtentorial dermoid tumours had been mentioned out of a series of one hundred and fifty-four intracranial tumours in children under the age of fifteen years. Other types of tumour were commoner and were more amenable to treatment. Including operation fatalities in Cushing's series the average prolongation of life had been six months after operation. There was a tendency to treat these children as if they had bilious vomiting until severe headache became prominent. Patients who were vomiting, should have their *fundi oculi* examined at least once a fortnight until a certain diagnosis had been established. It was too late to operate after hydrocephalus had developed. He described in some detail Cushing's methods of avoiding shock and hæmorrhage at the operation.

Dr. R. M. Downes, C.M.G., stated that the child had died two days after the operation for decompression. There had been a considerable amount of hæmorrhage. He had realized at the *post mortem* examination that it would have been impossible to have removed the tumour successfully. Preoperative diagnosis had been correct for once.

Dr. Webster informed Dr. Colville that almost all the tumours in his series had been subtentorial. They were usually diffuse gliomatous infiltrating masses which would be most difficult to remove at operation. The only supratentorial tumours he had seen had been hydatid cysts.

Spirochætal Bronchiectasis.

Dr. Webster's second specimen was one of spirochætal bronchiectasis associated with cerebral abscess. The patient, a boy of ten years and nine months, had had a cough with expectoration for five months since the removal of his tonsils and adenoids. He had not been strong since the operation. Three weeks later he had had an illness which had been diagnosed as typhoid fever. This illness had been complicated with pneumonia. The fever had continued for a week and a week later a cough had appeared and the cough had persisted up to the time of the patient's admission to hospital. He had been coughing up a large quantity of pus from time to time. On admission the signs of pneumonia had been present. No fluid had been obtained on *paracentesis thoracis*. The patient had gradually improved. No information concerning the nature of the condition had been obtained from bronchoscopy or the application of the Casoni and Wassermann tests. After a month a tender swelling had appeared in the left forearm. This had been caused by osteomyelitis with stripping of the periosteum of the ulna for eight to ten centimetres. No pus had been found in the medulla of the bone. Three days later meningeal signs had manifested themselves and the patient had died from a cerebral abscess.

At the *post mortem* examination a general dilatation of the bronchi, diffuse and fusiform, had been found. The somewhat profuse expectoration had suggested actinomycosis, but microscopical examination had revealed a spirochæte with definite coils, non-acid-fast and not capable of artificial culture. Intratracheal and intravenous injections of the pus into a rabbit had produced no effect. The pus from the abscess in the ulna had been found to contain the same spirochætal organisms. No one to whom Dr. Webster had appealed, had been able to suggest what the organism might have been. He submitted that the tonsillectomy might have been the cause of the infection or had caused its spread to the bronchi. He had investigated the possibility of the infection having been of the Vincent's type, but without success.

Dr. R. M. Downes, C.M.G., agreed that the tonsil operation had probably been the exciting cause. He had suspected a foreign body in a bronchus, until this had been excluded by the skiagraphic findings and the condition at operation.

Congenital Cardiac Lesion.

Dr. Webster exhibited the specimen of a heart with a congenital aortic maldevelopment and cardiac hypertrophy. The heart was that of an infant who had died at the age of nine weeks. It had not thrived from birth, had been pale and subject to attacks of breathlessness and pallor. Dr. Webster held that this lesion was commoner in pulmonary stenosis. It was usually associated with a patent *ductus arteriosus*. The patient had been shown at a previous meeting of the society with the signs of congenital heart disease. The X ray shadow revealed cardiac hypertrophy. After death definite aortic narrowing and rigidity had been found; there had been only two cusps in the aortic valve.

Kidney Lesions.

Dr. Webster also showed a polycystic kidney removed at operation from a girl, aged six and a half years. For three years she had suffered from pain in the upper regions of the abdomen. A mass had been discovered in the right hypochondrium on routine examination during an intercurrent febrile illness. The mass had given the impression of being a large round tumour, the size of an orange. On cystoscopic examination after a dye test had been carried out, it was found that the right kidney was not functioning. The surgeon had been unable to pass the ureteric catheter up the right ureter. The left kidney function had been found to be normal. The urea concentration test had yielded a concentration of about 3·5% or more.

Dr. H. C. Colville held that the condition of polycystic kidney was usually bilateral. He wondered why this kidney had not secreted. He suspected that a concomitant ureteric obstruction had been present. He thought that the other kidney was probably cystic and that if that were so the prognosis would be bad. It had not been possible to pass the ureteric catheter on the affected side while it had been passed with ease on the other side.

Dr. Webster also showed a specimen of two kidneys taken *post mortem* from a child who had suffered from a clinical condition like a prolonged bacilluria. The left kidney was affected by evident pyelonephritis, but the right kidney was apparently normal.

THE MEDICAL SCIENCES CLUB OF SOUTH AUSTRALIA.

A meeting of the Medical Sciences Club of South Australia was held at the University of Adelaide on August 3, 1928.

Sugar Tolerance Tests.

Dr. Ray Hone gave an account of the clinical value of sugar tolerance tests in the light of some years' experience of the same. He said that although it was known that such tests were subject to many variable factors, their clinical value was not impaired thereby, provided that the conditions under which the test was made were maintained as nearly standard as possible. Various factors influencing the test were mentioned, the chief being the effect of the length of the fasting period prior to the test being made. The routine estimation in the morning before breakfast was the best, as any muscular activity affected the results.

Secondly, the dosage of glucose was considered, one gramme per kilogram being suggested as suitable for children, while for adults fifty grammes of glucose were usual. Commercial glucose being difficult to weigh, this figure was not easy to obtain accurately.

Methods for obtaining the blood were discussed and it was shown that venous and arterial blood sugar levels in the fasting subject were the same. For glucose tolerance test, however, there was a difference between venous and arterial blood. Finger-tip blood (capillary) was the best.

The effect of exercise was mentioned, it having been shown that walking exercise might cause a rise of 1·4 milligrammes per hundred cubic centimetres of blood, while the effect of the state of mind of the patient was not to be overlooked, everything being done to reassure the subject, otherwise errors due to sugar mobilization were introduced.

It had been stated that the effect of nausea produced by the large dosage of glucose was to lower the blood sugar, but this was not supported by the author's experience. Of the methods in use he favoured Folin's as still being the best.

An account was then given of the normal types of curves and the deviations therefrom and also an account of lævulose and di-hydroxy-acetone curves in diabetes. Hale White and Payne had shown that maintenance of the high point of the curve was due to continued absorption of sugar in those cases in which the stomach emptied slowly.

Renal glycosuria was also considered and curves were exhibited in which fasting blood sugar was 0·1 milligramme per hundred cubic centimetres, the urine containing sugar at this level. From the point of view of life insurance the prognosis was considered good. One patient, however, after two and a half years' progress had given a more diabetic type of curve. A number of patients was shown illustrating the fact that in diabetes the sugar excretion threshold was above normal, sometimes very much so. Another showed contemporaneously low threshold and high blood sugar of typical diabetes.

An interesting case of renal glycosuria associated with pituitary tumour was cited. For ten years glycosuria had been present, while a recent tolerance curve had been normal. An increase of other symptoms led to a diagnosis of pituitary tumour, which had been removed. Unfortunately no further tests had been performed.

It was shown that salicylates do not, as supposed, alter the sugar tolerance curves.

Dr. R. L. T. Grant asked Dr. Lendon what attitude the insurance companies adopted towards renal glycosuria.

Dr. A. A. Lendon stated that insurance practice was to accept the tolerance curve as evidence and so far that practice had been justified.

The Effect of "Insulin."

A discussion took place on the effect of "Insulin," on the initiation of Dr. C. T. C. de Crespigny, who asked whether it acted both upon glycogenolysis and neoglycogenesis.

Dr. Ray Hone replied that the existing theory was that it affected both.

The Bundaberg Report.

Following this discussion Dr. Bull introduced the subject of the Commission's report on the Bundaberg antitoxin fatalities and the chief points mentioned in the finding of the Commission having been mentioned, the subject was then left over for discussion at the following meeting.

Obituary.

ROBERT ANDREW STIRLING.

For fifty years the medical profession in Melbourne has learned to appreciate and value the efficiency and geniality of Robert Andrew Stirling. During that long period he gained many staunch friends and as a result of his kindly disposition and gentle manner he won almost universal popularity. His death is mourned by young and old, by those with whom he came in daily contact and by those who met him but occasionally. The deep regret has extended far beyond the confines of Melbourne, for a man of his attainments could not have restricted the sphere of his influence to the narrow limits of one city. He died at his home in the St. Kilda Road, Melbourne, on August 23, 1928.

Robert Andrew Stirling was born in the year 1855 at Richmond. He was the second son of the late George Stirling. He went to school at Wesley College and there laid the foundation for his future success. In the year 1873 he entered the University of Melbourne and after having passed through his course without distress or failure, he took the degrees of bachelor of medicine and master of surgery in 1877. Soon after he journeyed to Europe and continued his studies in London, Edinburgh and Heidelberg. He returned to Melbourne in 1881 and started in practice shortly after. At first he served as a resident medical officer at the Melbourne Hospital, then he was appointed medical superintendent at the same institution. Later he served on the honorary medical staff as surgeon in charge of the dermatological out-patient clinic and still later he became honorary surgeon. His tastes from the earliest days of his professional career inclined towards surgery. In those days there were few candidates for the positions of trust and those few who secured them, deserve all the more credit for the manner in which they maintained a high standard of efficiency. Stirling was no exception in this respect. His thoroughness, his ability to impart knowledge he had acquired and his intense interest in the welfare of his profession combined to make him a teacher of distinction. He was chosen at a relatively early age to be lecturer in surgery at the University of Melbourne. He worked with great energy for the benefit of his university and his hospital and students and patients alike have every reason to remember with gratitude the fruitful efforts of this kindly and erudite surgeon. In private practice he was eminently successful and was held in high esteem by an ever-increasing number of patients and by his colleagues. He had his rooms in Lonsdale Street, close to the gates of the Melbourne Hospital, in order that he might reach his patients with little loss of time when his help was needed in emergency. He had a private hospital in Carlton.

In addition to his surgical and general medical work, he acted for many years as chief medical referee in Melbourne for the Australian Mutual Provident Society.

In private life he was a delightful companion and a man of varied tastes. He read deeply and played energetically. From his youth onwards he was fond of all outdoor sport and he kept up his tennis until old age placed its seal on his muscles. Time had a far more difficult task in restricting the activities of his mind and his energy. He took a great interest in the affairs of his church and served for many years as a member of the vestry of All Saints' Church. He is survived by Mrs. Stirling and a family.

Mr. F. D. Bird writes:

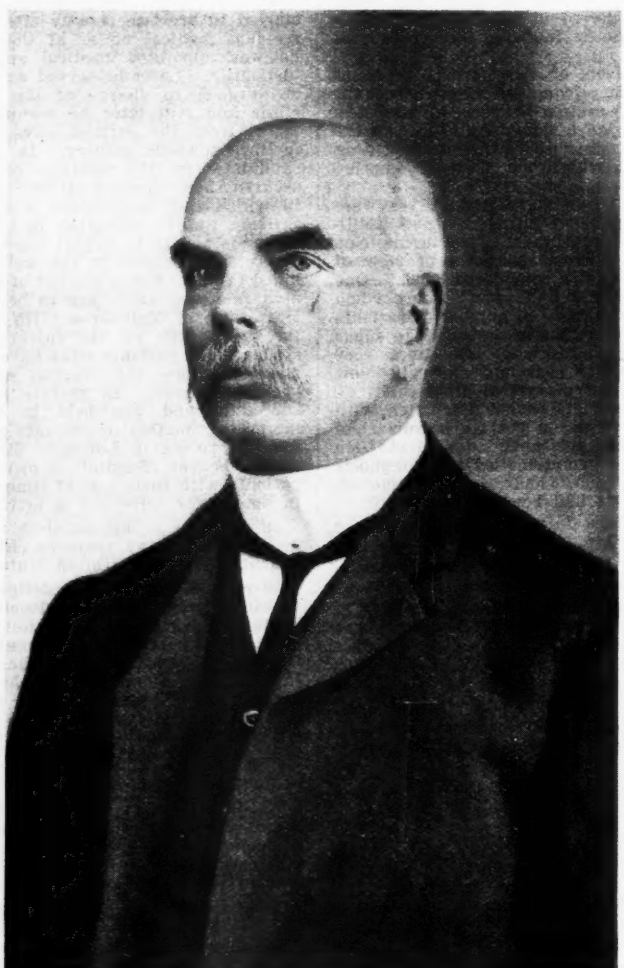
The death of Dr. Robert Stirling removes all but two of those surgeons who may without undue magnification be looked upon as the surgical fathers of Melbourne. The elder statesmen, including Girdlestone, James, Howitt and Fitzgerald, passed away years ago.

Dr. Stirling was lucky enough to come into the transitional stage between the older masters and the final conquest of the world by Listerism of which London was at first most critical, while Paris was appreciative. Berlin embraced it, but Melbourne only hovered and kept on hovering. Dr. Stirling was also very fortunate in having a flexible intellect, which soon exercised itself in the new ways of Listerian sanity. It was a new surgical heaven opening for ourselves and the old earth not opening for our patients. I sometimes think that those who were educated in the transition time, had a fuller appreciation of what Listerism meant, than those whose education brought them into an already educated world. I shall never forget that Bob, as he was regardfully called, was operating, when a carbolic spray burst. His caustic remarks and the superheated steam from the spraying demon were not to be separated. The same thing happened one day when I was assisting Fitzgerald and the two explosions were undoubtedly twins.

In all certainty we can say that Stirling assisted at the birth of an antiseptic conscience in Melbourne. He also

had a large share in those excursions we made from the subtropical zone of carbolic antisepsis into the ampler ether of asepsis, but it was not always well *in summa athere* and what we would now call crashes, occurred occasionally thence.

Of a verity it may be said that Robert Stirling occupied a very considerable place in the surgical life of Melbourne. He and I shared three wards of the Melbourne Hospital for many years and I am glad to record the statement that in all those years nothing but the most friendly relationship subsisted between us. I had the opportunity of seeing how very excellent his practice of surgery was. His operative skill is best described as sufficient, *id est* it was in all circumstances sufficient for whatever pathological condition came along. He never did too much, realizing that the acme of beneficent surgical intervention was found in the belief in the smallest common denominator of execution being used in each case. He never strove for unnecessary effect and frills were not to be found in his surgical armamentarium.



In the very nature of things it cannot but be that the end result of an operation is the only true criterion of success as regards the surgeon and by this standard Stirling's achievement was great, as I can testify from hospital propinquity and collaboration. He worked much at the old, old, but ever new subject of resection and reparation of intestine. He shortened the intestines but not the lives of many University dogs. Another much more recently discovered field of surgery was cultivated by him with splendid results, *viz.* splenectomy for that strange complaint then known as familial splenic anæmia. He discovered one family which kept him splenectomically amused for a long time.

His work at the Australian Mutual Provident Society which covered many years of his life, wherein he followed in my father's footsteps, was much appreciated by that wonderful institution. I cannot help thinking that his surgical reputation would have shone even more brightly had it not suffered from partial eclipse by the A.M.P. work.

Thus Melbourne has lost a powerful and useful personality which loss we deplore, but the scheme of things as we see it cannot owe a man much who carries the affection of his friends and the loved weight of his work to a point well beyond the statutory limit of seventy years.

If much space were allowed me, I could fill it with the recital of instances of his exceeding kindness to students wrecked on the rocks of ill-health during their course, of friendly help to overworked nurses and poorer patients and in my own person I am acutely and gratefully aware of a stream of books given to me in these latter years to mitigate the rigour of old age. I cannot doubt his taste in literature, as the books were always those I should have chosen myself.

Dr. J. W. Springthorpe writes:

Death's dart has ended a friendship of fifty years—"*Ave atque vale, Frater.*" "Bob," as he always was to everyone, was two years my senior at "the shop" in 1875-6-7, halcyon days of few students, less competition, more play, less work and more self-teaching than with our present day young patricians. Then we had the time of our lives, traditions of which linger to this day. His subsequent career led him to London, Edinburgh and Heidelberg, culminating in forty years in "old Melbourne" in every possible capacity as well as founder of "Loughtane" and Chief Medical Officer to the Australian Mutual Provident Society from first to last. Always genial, he everywhere inspired confidence and affection. Students, patients and fellow practitioners all swore by him.

For some forty years he was my corresponding surgeon both within and without the hospital. So as always to be available, he lived opposite the main entrance and few were the urgent or critical patients who waited for him long. I had innumerable opportunities of seeing his work, mostly, of course, from the physician's side. To me he was a born surgeon, his intuitions never failed. A prolific reader, he was always up to date. An exceptionally skilled operator, he always had beside him the best of anæsthetists and assistants. No wonder many said that his were "the best results of all." He was one of our aseptic surgeons and in some branches, such as splenectomy, he was an Australian pioneer. Many a time have I seen him snatch life from death or restore to usefulness and many a time also have I known him refrain from operating both when he was led to believe an operation was not necessary or because he himself judged one to be unwise. He was not a publicist, though full of matter and armed with a good style; rather like W. G. Grace, he was a doer, not a talker; yet amongst other things he wrote two short surgical statements for my text book.

Three other points stood out. He was always independent and belonged to no clique, with the usual results, for and against such isolation. He was a friend, true as steel, always helpful, whenever and however he could, even to the sending of newspapers to me regularly during the long

years of war (though *The Bulletin* was often pinched in transit). And from his home life of twenty-seven years both wife and children have gained a constant stream of memories that can never fade. Thus loved and revered and surrounded by friends he worked on almost to the last.

ALEXANDER CLOW FRASER.

Alexander Clow Fraser, whose death was announced in The Medical Journal of Australia of September 15, 1928, was born in Terang in the year 1885. His father was the late Samuel Fraser, a clergyman in Terang. Alexander Fraser received his early education at Scotch College, Melbourne, where he achieved a considerable amount of success. He became *dux* of the school at the age of seventeen in 1902. After leaving school he entered the University of Melbourne and started his arts course in 1903. He went into residence at Ormond College. He obtained second class honours in Greek and Latin and gained an exhibition in his first year; in his second year he divided the exhibition in classics and comparative philology and in his third year he again gained second class honours and divided the final scholarship in classics and comparative philology. He then started his medical course. In his first year he obtained third class honours in chemistry; in his third year he gained third class honours in anatomy; in his fourth year he gained third class honours in pathology and in his final year he gained second class honours. He graduated in medicine and surgery in 1914. After he had gained his arts degree he took up teaching at Homebush, near Sydney, for one year. During his second year in medicine, he took the degree of master of arts. In 1908 and 1909 he again took up teaching, this time at Saint Peter's College, Adelaide. During the following four and a half years he completed his medical course. He then entered the Melbourne Hospital as resident medical officer. In 1915 he married and immediately enlisted for active service. He went out with a contingent of the Australian Imperial Forces and on reaching France was drafted to the Sixth Field Ambulance. Later he was transferred to the Twenty-fourth Battalion to which he served as regimental medical officer. He obtained his majority in August, 1917. Later he became ill and was admitted to hospital, where he stayed until February 4, 1918. He was at the Third Australian Auxiliary Hospital at Dartford for one month and thence he was moved to the Australian Army Medical Corps Training Depôt at Parkhouse and Fovant until April, 1919. He was mentioned three times in the military dispatches. From April until August in the same year he undertook post-graduate work in Edinburgh. He returned to Australia in October and was demobilized in December.

Soon after his return he commenced practice at Korrumburra, in Victoria, where he was in close collaboration with his old friend Dr. J. S. Reed. For nearly eight years he has worked assiduously at his practice, gaining experience and winning the goodwill of all men. His patients loved him and he held the affection and esteem of his colleagues. In August of this year he contracted a pneumonic infection and it proved fatal on August 30, 1928. The sympathy of the medical profession is extended to his widow and child.

Dr. William Begg writes:

As a close friend of the late Dr. A. Clow Fraser I should like to express my regret at his untimely death. He has been an intimate friend of mine since his student days and our house was his home whenever he came to town.

His brilliant University career and war service will be dealt with by others; it is more of his qualities as a man that I would like to tell. Grit and determination were prominent features of his character, as evidenced by the fact that after completing his arts course and taking the classical exhibition, he set himself the task of earning the money by teaching to put himself through the medical course, passed his final M.B., Ch.B. examination with second class honours and after a year as resident in the Melbourne Hospital put in three years of distinguished service in the Australian Imperial Forces. As a medical man he was a keen student and always anxious to keep his knowledge up to date. He had a busy country practice and did not spare himself in his efforts for his patients' welfare. As a Korrumburra resident he took a great interest in local affairs and was especially active in the tennis and bowling clubs of which he was president. As a son of the Manse he carried on the tradition in which he was reared and was a strong supporter of the Korrumburra Presbyterian Church in which he held office as an elder. But with all his devotion to duty Fraser had a keen relish for all forms of clean amusement and when he came to town for a hard-earned spell he was like a boy let loose from school. One of his first questions was sure to be: "Is there anything good on at the theatres?" and whether it was a comic opera or a play he enjoyed every minute of it. We shall all miss his hearty genial manner and his friendly greeting and life will be the poorer for his loss.

He had a large and representative funeral at which, in spite of the short notice, the medical profession was well represented. Numerous and heartfelt were the expressions of regret heard on every hand and much sympathy will be felt for his widow and little girl in their sad bereavement.

Dr. Keith McK. Doig writes:

When I first met Alex. Fraser he had completed his arts course with honours and was a medical student in Ormond College where as time went by we learned to know him for what he was. He was essentially a man of strong character with an honest heart and a clear mind. From the start he took a leading part in student life where his influence was always for good and for the honour of his college and university. He was president of the Ormond College Students' Club, president of the Students' Representative Council and a member of the Blues Committee and in all the little exigencies of university life it was to him we turned for guidance. His opinions were clear cut and he did not trifle with truth. Determination was written on his face, but more than that was the honesty of purpose that accompanied all he did or said. This might picture a stern type of character, but it was all delightfully leavened with a nice sense of humour and it is pleasant to recall even now the twinkle in his eyes when he appreciated the lighter side of something said or done. Although he did not excel at athletics, by his determined manner he became a member of the Ormond crew and played tennis with the Ormond four.

He gave us the benefit of his wider education and his clear thinking brain in all manner of ways and we were indebted to him for the example he set in always seeking the truth of things. And so the respect that we felt for him at first, soon became linked with genuine affection.

After graduating in medicine he became a resident medical officer at the Melbourne Hospital where he gained valuable experience. After some months of conscientious work he enlisted in the Australian Army Medical Corps where he rose to the rank of major. His work in the Army was characterized by the same diligence and clear-sightedness and he earned respect and affection wherever his work took him. After the war he settled down to general practice in Korrumburra, where his life was an influence for good throughout the district. His was a broad vision. He felt the duties of citizen as well as those of his profession and it was in the practice of his profession that he developed the illness that so quickly proved fatal. He left behind him in Korrumburra many sorrowing hearts amongst all classes of the community, whom he served with skill, honesty and sympathy. In the profession and outside of it his death will be mourned by many, but to those of us who were privileged with his friendship the memory of his lovable character will always be cherished. To his wife and small daughter we tender our chief sympathy in their great loss.

BOUND JOURNALS AVAILABLE.

We have been asked to intimate that the following bound volumes of *The British Medical Journal* are available without cost to any medical library: Volumes I and II, 1889; Volume I, 1890. Application should be made to Dr. N. M. G., Post Office Box 206, Toowoomba, Queensland. The volumes are at present stored in Melbourne.

Proceedings of the Australian Medical Boards.

VICTORIA.

THE undermentioned have been registered under the provisions of Part I of the *Medical Act*, 1915, of Victoria, as duly qualified medical practitioners:

Dale, John, M.B., Ch.B., 1908, B.Sc. (Public Health), 1909 (Birmingham), M.R.C.S. (England), L.R.C.P. (London), 1908, Town Hall, Melbourne.

Hayes, Vincent Leo Patrick, M.B., Ch.B., 1926 (Univ. of Edinburgh), c.o. Mrs. Collins, "Braemar," Shelley Street, Elwood.

Additional qualification registered:

Love, Joseph, Ch.B., 1908, M.S., 1928 (Melbourne).

King, Edgar Samuel John, F.R.C.S. (England), 1927.

Books Received.

MODERN BIOLOGY: A REVIEW OF THE PRINCIPAL PHENOMENA OF ANIMAL LIFE IN RELATION TO MODERN CONCEPTS AND THEORIES, by J. T. Cunningham, M.A. (Oxon.), A.L.S.; 1928. London: Kegan Paul, Trench, Trubner and Company, Limited; Sydney: Angus and Robertson, Limited. Demy 8vo., pp. 256. Price: 12s 6d.

RULES FOR RECOVERY FROM PULMONARY TUBERCULOSIS: A LAYMAN'S HANDBOOK OF TREATMENT, by Lawrason Brown, M.D., Fifth Edition, thoroughly revised; 1928. Philadelphia: Lea and Febiger. Crown 8vo., pp. 244. Price: $1·50 net.

THE OPIUM PROBLEM, by Charles E. Terry, M.D., and Mildred Pellens; 1928. New York: The Committee on Drug Addictions in collaboration with The Bureau of Social Hygiene, Incorporated. Royal 8vo., pp. 1053.

DENTAL MEDICINE, by F. W. Broderick, M.R.C.S., L.R.C.P., L.D.S. (England); 1928. London: William Heinemann (Medical Books) Limited. Demy 8vo., pp. 380. Price: 21s. net.

THE TONSILS AND ADENOIDS AND THEIR DISEASES: INCLUDING THE PART THEY PLAY IN SYSTEMIC DISEASES, by Irwin Moore, M.B., C.M. (Edinburgh); 1928. William Heinemann (Medical Books) Limited. Demy 8vo., pp. 414, with illustrations. Price: 21s. net.

Diary for the Month.

OCT. 6.—New South Wales Branch, B.M.A.: Delegates of Local Associations Meet Council (Second Day).
OCT. 9.—Tasmanian Branch, B.M.A.: Branch.
OCT. 9.—New South Wales Branch, B.M.A.: Ethics Committee.
OCT. 11.—Victorian Branch, B.M.A.: Council.
OCT. 11.—New South Wales Branch, B.M.A.: Clinical Meeting.
OCT. 12.—Queensland Branch, B.M.A.: Council.
OCT. 15.—New South Wales Branch, B.M.A.: Organization and Science Committee.
OCT. 16.—Tasmanian Branch, B.M.A.: Council.
OCT. 16.—New South Wales Branch, B.M.A.: Executive and Finance Committee.
OCT. 17.—Western Australian Branch, B.M.A.: Branch.
OCT. 17.—Central Northern Medical Association, New South Wales.
OCT. 23.—New South Wales Branch, B.M.A.: Medical Politics Committee.

Medical Appointments Vacant, etc.

For announcements of medical appointments vacant, assistants, *locum tenentes* sought, etc., see "Advertiser," page xviii.

LAUNCESTON PUBLIC HOSPITAL: Junior Resident Medical Officer (Male).

RENWICK HOSPITAL FOR INFANTS, SUMMER HILL: Resident Medical Officer.

ROYAL NORTH SHORE HOSPITAL OF SYDNEY: Honorary Assistant Gynæcologist and Honorary Obstetrician, Honorary Relieving Medical Officer to Out-Patients.

THE OTAGO HOSPITAL BOARD: Resident Medical Officer.

THE TOWNSVILLE HOSPITALS' BOARD: Medical Superintendent.

Medical Appointments: Important Notice.

MEDICAL practitioners are requested not to apply for any appointment referred to in the following table, without having first communicated with the Honorary Secretary of the Branch named in the first column, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

BRANCH.	APPOINTMENTS.
NEW SOUTH WALES: Honorary Secretary, 30 - 34, Elizabeth Street, Sydney.	Australian Natives' Association. Ashfield and District United Friendly Societies' Dispensary. Balmain United Friendly Societies' Dispensary. Friendly Society Lodges at Casino. Leichhardt and Petersham United Friendly Societies' Dispensary. Manchester Unity Medical and Dispensing Institute, Oxford Street, Sydney. Marrickville United Friendly Societies' Dispensary. People's Prudential Benefit Society. Phœnix Mutual Provident Society.
VICTORIAN: Honorary Secretary, Medical Society Hall, East Melbourne.	All Institutes or Medical Dispensaries. Australian Prudential Association Proprietary, Limited. Mutual National Provident Club. National Provident Association. Hospital or other appointments outside Victoria.
QUEENSLAND: Honorary Secretary, B.M.A. Building, Adelaide Street, Brisbane.	Members accepting appointments as medical officers of country hospitals in Queensland are advised to submit a copy of their agreement to the Council before signing. Brisbane United Friendly Society Institute. Stannary Hills Hospital.
SOUTH AUSTRALIAN: Secretary, 207, North Terrace, Adelaide.	All Contract Practice Appointments in South Australia. Booleroo Centre Medical Club.
WESTERN AUSTRALIAN: Honorary Secretary, 65, Saint George's Terrace, Perth.	All Contract Practice Appointments in Western Australia.
NEW ZEALAND (WELLINGTON DIVISION): Honorary Secretary, Wellington.	Friendly Society Lodges, Wellington, New Zealand.

Medical practitioners are requested not to apply for appointments to position at the Hobart General Hospital, Tasmania, without first having communicated with the Editor of THE MEDICAL JOURNAL OF AUSTRALIA, The Printing House, Seamer Street, Glebe, New South Wales.

Editorial Notices.

MANUSCRIPTS forwarded to the office of this journal cannot under any circumstances be returned. Original articles forwarded for publication are understood to be offered to THE MEDICAL JOURNAL OF AUSTRALIA alone, unless the contrary be stated.

All communications should be addressed to "The Editor." THE MEDICAL JOURNAL OF AUSTRALIA, The Printing House, Seamer Street, Glebe, Sydney. (Telephones: MW 2651-2.)

SUBSCRIPTION RATES.—Medical students and others not receiving THE MEDICAL JOURNAL OF AUSTRALIA in virtue of membership of the Branches of the British Medical Association in the Commonwealth can become subscribers to the journal by applying to the Manager or through the usual agents and booksellers. Subscriptions can commence at the beginning of any quarter and are renewable on December 31. **The rates are £3 for Australia and £2 5s. abroad *per annum* payable in advance.**